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**Dedicated to the Indomitable Spirit & Sacrifices of the SOF Medic**

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# COVER

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## From the Editor

The Journal of Special Operations Medicine (JSOM) is an authorized official military quarterly publication of the United States Special Operations Command (USSOCOM), MacDill Air Force Base, Florida. The JSOM is not a publication of the civilian Special Operations Medical Association (SOMA). Our mission is to promote the professional development of Special Operations medical personnel by providing a forum for the examination of the latest advancements in medicine.

**Disclosure Statement:** The JSOM presents both medical and nonmedical professional information to expand the knowledge of SOF military medical issues and promote collaborative partnerships among services, components, corps, and specialties. It conveys medical service support information and provides a peer-reviewed, high quality print medium to encourage dialogue concerning SOF medical initiatives. The views contained herein are those of the authors and do not necessarily reflect the official Department of Defense position. The United States Special Operations Command and the Journal of Special Operations Medicine do not hold themselves responsible for statements or products discussed in the articles. Unless so stated, material in the JSOM does not reflect the endorsement, official attitude, or position of the USSOCOM-SG or of the Editorial Board.

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Articles, photos, artwork, and letters are invited, as are comments and criticism, and should be addressed to Editor, Journal of Special Operations Medicine, USSOCOM, SOC-SG, 7701 Tampa Point Blvd., MacDill AFB, FL 33621-5323. Telephone: DSN 299-5442, commercial: (813) 828-5442, fax: -2568; e-mail [JSOM@socom.mil](mailto:JSOM@socom.mil).

The JSOM is serial indexed (ISSN) with the Library of Congress and all scientific articles are peer-reviewed prior to publication. The Journal of Special Operations Medicine reserves the right to edit all material. No payments can be made for manuscripts submitted for publication.

**Official Distribution:** This publication is targeted to SOF medical personnel. There are several ways for you to obtain the Journal of Special Operations Medicine (JSOM). 1) USSOCOM-SG distributes the JSOM to all our SOF units and our active editorial consultants. 2) SOMA members receive the JSOM as part of membership. Please note, if you are a SOMA member and are not receiving the subscription, you can contact SOMA through [www.somaonline.org](http://www.somaonline.org) or contact MSG Russell Justice at [justicer@soc.mil](mailto:justicer@soc.mil). SOMA provides a very valuable means of obtaining SOF related CME, as well as an annual gathering of SOF medical folks to share current issues. 3) For JSOM readers who do not fall into either of the above mentioned categories, the JSOM is available through paid subscription from the Superintendent of Documents, U.S. Government Printing Office (GPO), for only \$30 a year. Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. GPO order desk-telephone (202) 512-1800; fax (202) 512-2250; or visit <http://bookstore.gpo.gov/subscriptions/alphabet.html>. You may also use this link to send a email message to the GPO Order Desk—[orders@gpo.gov](mailto:orders@gpo.gov). 4) The JSOM is online through the Joint Special Operations University to all DoD employees at <http://www.hurlburt.af.mil/jsou>. On the left you will have several tabs; you must first “log-in” using your SS#, DOB, and name; then go to “publications.” Scroll down until you get to the JSOM and click on the picture. From this site, you can link straight to the Government Printing Office to subscribe to the JSOM. We are working with the JSOU to have a SOCOM-SG medical site; we will keep you posted as that progresses. 5) The JSOM can also be emailed in PDF format; if you would like to be added to the PDF list please send your request to [jsom@socom.mil](mailto:jsom@socom.mil).

Don't forget to do your CMEs!!!! Please let us know how you like the crossword puzzles. Remember, our continuing education is for all SF medics, PJs, and SEAL corpsmen. In coordination with the Uniformed Services University of Health Sciences (USUHS), we offer CME/CNE to physicians, PAs, and nurses.

The JSOM remains the tool that spans all the SOF services and shares medical information and experiences unique to this community. The JSOM continues to survive because of the generous and time-consuming contributions sent in by physicians and SOF medics, both current and retired, as well as researchers. We need your help! Get published in a peer-review journal NOW! See General Rules of Submission in the back of this journal. We are always looking for SOF-related articles from current and/or former SOF medical veterans. We need you to submit articles that deal with trauma, orthopedic injuries, infectious disease processes, and/or environment and wilderness medicine. More than anything, we need you to write CME articles. Help keep each other current in your re-licensure requirements. Don't forget to send photos to accompany the articles or alone to be included in the photo gallery associated with medical guys and/or training. If you have contributions great or small... send them our way. Our e-mail is: [JSOM@socom.mil](mailto:JSOM@socom.mil).

Enjoy this edition of the journal, send us your feedback, and get those article submissions in to us now!

Maj Michelle DuGuay



# From the Surgeon



Frank Butler, MD  
CAPT, USN  
HQ USSOCOM Command Surgeon

This is a somber, but resolute, time at USSOCOM as the Command honors the memory of the eight Special Operations Aviation Regiment personnel and eleven SEALs killed in the recent action in Afghanistan. These fatalities represent SOF's worst single-day loss in the Global War on Terrorism (GWOT) and remind us of the constant dangers that our operators face as they defend our nation against the savagery of terrorism. If our fallen brothers could have left us with a parting thought, there is little doubt that it would have been: "Finish the job."

## Welcome

There are three new faces in our office since the last time we wrote a "Welcome" section in this column. Major Tim Dykens came to USSOCOM from Special Operations Command Pacific. Tim has extensive experience in SOF medical planning as well as an in-depth knowledge of TRICARE management issues. He will be a great asset to the Ops "bullpen" and has inherited Jim Lorraine's duties as the director of manpower and resource issues for USSOCOM medical. His contact information is 813-828-5051, [dykenst@socom.mil](mailto:dykenst@socom.mil).

Major Chris Coley arrived in Tampa after recent tours at one of our Special Missions Units and the Office of the Surgeon General of the Army. Chris has assumed the lead role for medical planning for the Center for Special Operations and is instrumental in dealing with the medical aspects of our deployable Joint Task Force. His contact information is 813-828-2719, [coleyc@socom.mil](mailto:coleyc@socom.mil).

We welcome LTC Tracy Wyatt who has just joined us from Forces Command where he had recent hands-on experience in helping to provide medical assets to support SOF in the GWOT. LTC Wyatt is a career MEDEVAC pilot and will also provide his valuable expertise in this area. He has assumed the duties of Deputy Command Surgeon and is in charge of the medical operations section at USSOCOM medical. He can be reached at 813-828-7651, [wyattt@socom.mil](mailto:wyattt@socom.mil).

## Kudos

The last three months were busy ones in the Special Operations medical community with many accomplishments to recognize. Col Donna Meyers, SMSgt Rick Lepley, SMSgt Pat Sampson, HMC Raul Morales, and the rest of the staff at the SOCOM Clinic conducted a health fair for the USSOCOM Headquarters staff on 23 June. Our Chief of Staff, BGen George Flynn, opened the fair and many service members and their families came in to take advantage of the opportunity to obtain blood pressure checks, lipid profiles, and educational information on a variety of subjects to include diet, management of hypertension and hyperlipidemia, and sports medicine issues. Kudos also to Col Meyers and her staff for leading the effort to obtain automated external defibrillators for USSOCOM. BGen Flynn approved this effort and we are procuring these as this goes to press.

Thanks from our office to COL Warner "Butch" Anderson, who has recently stepped down as the Senior Editor of the JSOM. Butch volunteered his time and expertise for five years in this capacity and his

efforts have helped the JSOM grow into the well-respected voice of SOF medicine that it is today. The office sent a letter of appreciation acknowledging COL Anderson's efforts to the Commanding General of the JFK Special Warfare Center and School. Great job, Butch!

We also congratulate COL Kevin Keenan and the staff at the Joint Special Operations Medical Training Center. The Committee on Accreditation of Educational Programs for the EMS Professions (CoAEMSP) and the Commission on Accreditation of Allied Health Education Programs (CAAHEP) recently reviewed the Center. Both groups found the JSOMTC complied with their national standards as defined by their respective educational groups and recommended that the JSOMTC be accredited until 2010. This accomplishment requires meticulous attention to a myriad of academic details and COL Keenan and his staff performed superbly to pass these inspections in a manner that reflects extremely well on the SOF medical community. We also congratulate COL Keenan for his ongoing efforts to obtain the invaluable benefits of college credits for our SOCM students at the JSOMTC who are working towards college degrees.

### **Human Use Research in SOF**

Thinking of undertaking a biomedical research project in your unit? The wide range of issues that SOF medical providers deal with in the course of their jobs leads some individuals to decide that our knowledge base needs to be expanded by a research effort. If this is a decision that you are contemplating, you need to consult with your respective component surgeon before beginning your project. Human use research in the Department of Defense is regulated by DOD Directive 3216.2. Any use of human subjects in a research protocol requires that the project be reviewed and approved by an Institutional Review Board (IRB). If this research is being conducted in one of the SOF components, it needs to be approved by the component commander after review by the component surgeon. These steps will ensure that the proposed project has been designed in a way that protects the safety of the SOF members participating in it and that the project will be conducted in a manner consistent with good scientific inquiry.

### **Combat First Responder Scenarios**

This edition of the JSOM contains a combat first-responder report from a recent engagement involving a Marine Recon unit. Key elements of the report include three lives being saved with the combat application tourniquet system (CATS) as well as two reports of windlass failures in these devices. This report also emphasizes the need to move quickly through a casualty scene initially to ensure that all external hemorrhage is controlled and then to continually reassess the casualties. Other points of emphasis in this scenario are the importance of training all SOF operators in Tactical Combat Casualty Care (not just the Corpsman or Medic), and the rapid pain control achieved with fentanyl lozenges. USSOCOM knows what a great job our combat first responders are doing in the war. First-hand accounts of casualties such as this will help us to document their successes and to find ways to help with treatment or equipment problems that are identified in the field. Capturing these lessons learned will also help our combat medics learn from previous casualty scenarios and use this knowledge to their advantage when the time comes for them to take care of their wounded teammates.

God bless you and God bless America.



SENIOR ENLISTED MEDICAL ADVISOR (SEMA)  
HMCM GARY WELT



This issue of the JSOM comes to you with some very deep and heartfelt sorrow, as you are all aware of the devastating events that have unfolded in the past few months with the recent losses of Special Operations personnel in Afghanistan and Iraq. My thoughts and prayers are with each and every one of the family members and friends who have lost loved ones during these trying times.

But more importantly, it is you, my Team Mates, my fellow SPECOP Medics, who are not faceless, who keep me awake at night continually thinking, wondering, “who’s next and who will I know on tomorrow’s list?” The list I refer to is the daily SOF Combat Casualty Report. For me, it always makes me cringe as I sit here and review it. My only saving grace is YOU, the Special Operations Medics that are out there day in and day out serving, protecting, fighting, and saving lives! You work so diligently to keep that list to a minimum and provide the best care available to our operational forces and team mates. This does not make my job easier, but more difficult in that you may have the need for that one item, that special procedure, that extra bit of kit, that may save another life. It is my job, my responsibility, and my quest to ensure that you are trained and equipped to handle those situations as they come at you. It is I who work for you, the Operational Force, the Warrior Medic, my team mates. I want you to know that the SOCOM medical wheels of progress (however slow they may be) shall never be impeded by the super-glue of bureaucracy as long as I am here. Your voice is heard, your vote does count, and you will get what you need based on your requirements.

Speaking about requirements, the new SOCM Critical Task List is formalized and on the street for the JSOMTC to implement. There are a few important changes that require your purview. As the guys on the ground, you have the responsibility to ensure that the new guys are tight in their practice as you teach them the skills needed to survive in their “new” environment. You also have the need and responsibility to LISTEN to them as they are bringing to the operational force the latest and greatest technologies and current medical practices.

For the first time since the implementation of the SOCM medic and certification, the SOCM-Advanced Tactical Practitioner (ATP) has an approved set of protocols issued by USSOCOM to follow. There is no other enlisted medic that has the range and scope of practice delineated by these protocols. They are not meant to limit individual thinking nor impede the medic’s ability to do his job, but rather to enhance that ability. Make no mistake, the ATP protocols are not intended for the 18D, SODIC, or IDMT, as they are certified to practice medicine in austere environments INDEPENDENT of a medical officer. This privilege has not previously been extended to the SOCM medic, but now, the Tactical Emergency Medical (TMEs) protocols give the ATP definitive guidance. It is incumbent on each senior medical practitioner, doctor, PA, 18D, or SOIDC assigned to SOF to ensure that he provides the oversight and guidance needed. You must make yourself familiar with the SOCM scope of practice to ensure a positive outcome.

The last JMEAC meeting was held 21-23 June 2005 in Tampa. All of the components were well represented as well as the JSOMTC. One of the major topics of discussion was the SOCMSSC course. This is the recertification course for the joint interoperable medical capability of SOF medicine as directed by the Chief of Staff USSOCOM in the 21 June 1999 memorandum. This course was originally designed to meet the requirements of recertification of all SOF medics, and provide a venue to maintain NREMT-P certification. Since we no longer require maintenance of the NREMT-P certification, it is time that we, the senior enlisted personnel, redefine what this course needs to provide for today’s mission. This requirement comes directly from you based on your input and suggestions. Please get with your specific service SEMA to ensure he has your requirements and input. Your negative communication during this process will only solidify your acceptance of whatever the final product is. Again, this is another opportunity to voice your thoughts and requirements, not opinion!

Gentlemen, thanks for what you do and your valuable time. Keep off that list by keeping your powder dry, eyes open, and muskets at the ready.

# *Meet Your JSOM Staff*

## **EXECUTIVE EDITOR**

Frank K Butler, MD  
[Butlerf@socom.mil](mailto:Butlerf@socom.mil)



CAPT Frank Butler graduated from Basic Underwater Demolition/SEAL training in 1972 as a member of Class 64 and subsequently served as a platoon commander in both Underwater Demolition Team Twelve and SEAL Team One. After attending medical school at the Medical College of Georgia, he did his internship in Family Practice at Naval Hospital Jacksonville. CAPT Butler spent five years as a Diving Medical Research officer at the Navy Experimental Diving Unit in Panama City, where he helped to develop many of the diving techniques and procedures used by the Navy SEAL teams today. He then did a residency in Ophthalmology at the National Naval Medical Center in

Bethesda, where he was Chief Resident in 1989. CAPT Butler was then assigned to the Naval Hospital Pensacola where he was Chief of Ophthalmology from 1989 to 1994. He assumed the duties of Director of Biomedical Research for the Naval Special Warfare Command in 1989 as well. He was transferred to his current position as Command Surgeon, US Special Operations Command, in March 2004.

## **MANAGING EDITOR**

Michelle D. DuGuay, RN  
[Duguaym@socom.mil](mailto:Duguaym@socom.mil)



Maj DuGuay joined the Army Reserve in 1987 and served as a nurse in a Combat Support Hospital unit for three years before switching services in 1990 to become an Air Force C-130 Flight Nurse. She is currently an IMA reservist attached to the SOCOM/SG office where she is in charge of management, production and publication of the JSOM. Maj DuGuay has a Bachelors in Nursing and a Masters in Business Administration/Management. Her career includes being a flight nurse in both the military and private sector, 15 years of clinical experience in emergency and critical care nursing as well as being an EMT and a legal nurse consultant. She also served as the military liaison to her Disaster

Medical Assistance Team (DMAT.) Prior to the SG office, Maj DuGuay's experience at USSOCOM includes an assignment in the Center for Force Structure, Resources, Requirements, and Strategic Assessments.



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Rocky Farr, MD  
COL, USA  
Command Surgeon

# USASOC



Before we realize it, it will be time for the December Special Operations Medical Association (SOMA) meeting in Tampa. Colonel Al Moloff is doing very good things with the organization. As I have stated before, if you (an NCO) get a presentation accepted by SOMA and need TDY funding, let me know.

We will have the usual USASOC Surgeon's Conference the weekend before SOMA. I would like to see all who are not decisively engaged in killing bad guys at this meeting. We plan to have a similar format to last year, with unit brief backs on Saturday and briefings from my office staff on Sunday. For any special requests on Sunday issues, or to schedule unit brief backs, contact my chief of medical training, Major Muller ([mullerd@soc.mil](mailto:mullerd@soc.mil)). We will send out an invitation letter to the MACOM Surgeon's conference closer to December. If you need it to support a TDY action, ask Major Muller.

I have just finalized the AMEDD officer assignments for this summer. We will run our Special Operations Medical Indoctrination Course (SOMIC) right after Labor Day for three days. If any one (AMEDD officer types) did not get a chance to go on their PCS into the Command, call my medical training folks, headed by Major Muller and we can see if we can fit you in. We have a reasonably small turnover this year, which may mean a bigger turnover in summer 2006. I am very pleased with the numbers of medical (and other AMEDD) officers with multiple, repeat assignments in SOF at various levels; it bodes well for someone growing up to be me, eventually. At 38 plus years of service, I do plan to depart eventually. I am particularly happy to have some "internal" PCSs, such as from regimental surgeon, 160th SOAR(A) to group surgeon, 10th SFG(A), and from Deputy Surgeon, USASOC to group surgeon, 1st SFG(A). In addition, several medical officers have returned from residency training programs to serve in the force again. Please encourage any young medical officers that you encounter to contact me ([farrwa@soc.mil](mailto:farrwa@soc.mil)) for information on SOF assignments. We could use some senior guys.

Just watched several units deploy--plenty of war to go around and everyone is doing great deeds out there. All my reviews of the clinical care that all our medics have provided downrange have shown that it is truly world class and our comrades are taken care of as well amid the flying bullets as they would have been on the relative calm of the steps of Massachusetts General Hospital. Keep up the good work, and keep getting recertified and Medical Proficiency Trained (MPT). I have just approved certification for MPT conducted at Combat Support Hospitals in theater. See MSG Troxler ([troxlerg@soc.mil](mailto:troxlerg@soc.mil)) for details. We also have an officer, as in medical officer (doctor), and physician assistant clinical "MPT" rotation developed and in place. It is also open to USAR and National Guard medical officers and PAs. Again, see my medical training section.

Guidance had been given by the commanding general that all long term training (LTT) must be vetted through the USAJFKSWCS IAUCUC. So any course or event that involved LTT that operates under someone else's protocol (like the American College of Surgeons ATLS) must be brought before the SWCS IACUC before you attend.

POC: Colonel Keenan ([keenank@soc.mil](mailto:keenank@soc.mil)). The IACUC plans to review and blanket “legalize” ACS ATLS at the next meeting. For all other LTT questions, contact LTC Brown ([brownd@soc.mil](mailto:brownd@soc.mil)).

Medical equipment fielding continues to be ongoing. The individual SOF aid kits are out and either have chitosan and a tourniquet or are being linked up with those items in theater. POC: MAJ Sully ([sullyh@soc.mil](mailto:sullyh@soc.mil)). MSG Rodriguez, MSG Troxler, and I have just attended the AUSA Medical Symposium. It is very interesting to see how the conventional army is quickly, finally adopting the tactical combat casualty care ways that we have been using for some time now. The TCCC “just in time” training team is constantly on the road bringing the latest recommendations and equipment to our force. POC: SFC Dominique Greydanus, U.S. Army Institute of Surgical Research at Fort Sam Houston, Texas ([Dominique.Greydanus@CEN.AMEDD.ARMY.MIL](mailto:Dominique.Greydanus@CEN.AMEDD.ARMY.MIL)). I hear he is looking for some teaching help too. Therefore, any broke 18Ds who want to live in San Antonio might contact him.

During the last Biomedical Initiatives Steering Committee meeting, there was a discussion on nutritional supplementation/food/caloric augmentation or whatever you would like to call it. Food is Class 1; rations are an S-4/G-4/Logistics issue, not a medical issue. If commanders or Soldiers approach you on it, direct them to the S-4. Three additional supplemental commercial off-the-shelf items for training purposes for SOF were approved by the DoD Nutrition Committee and endorsed by the Chief Dietician, U.S. Army. The items approved are Powerbar Performance, Clif Shot Gels and Gatorade Nutrition Shake. Three items were not approved by the committee (Cytomax, Endurox R4, and Myoplex Lite Bars) and will not be purchased with Military Food Program resources. These items are limited only to SOF when in a training environment (field duty) as defined in AR 30-22 and DA Pam 30-22. The Unit Food Operations Sergeant (FOS) and Food Service Officer (FSO) will ensure these items are requested in accordance with AR 30-22, Chapter 4 and DA PAM 30-22, Chapter 4 and Appendix H, the same as operational rations. These products have extended shelf life and may be held or transferred to another training unit if not totally consumed during the training exercise. Local veterinary personnel will assess shelf life to assure the products are wholesome for consumption. POC: Mr. Marak ([marakJ@soc.mil](mailto:marakJ@soc.mil)).

Let us not forget, fixated in the close battle, as we are, that nuclear, chemical and radiological scenarios could show up at anytime. Remember the courses out there for knowledge in those special areas. I write this as I listen to the London subway bombing reports. This will be a long war.





# NAVSPECWARCOM



Edward Woods, MD  
CAPT, USN  
Command Surgeon



Because of the advances in science and medicine in the last 100 years, individuals can expect to live longer and healthier lives. Even the practice of psychiatry now relies more and more heavily on neurophysiologic medications than doctor and patient supportive psychoanalysis and psychotherapy to help patients. The greater the influence of science on the practice of medicine, the more important it is for practitioners to practice the art of medicine. The SOF community is not excluded. Too often, the expectation is that medical technology will fix any condition or disease and all that is required is to spend enough money to do research to develop it. In recent years, as the SOF mission and forces have become more greatly appreciated, the belief that where SOF goes, so too should the military, has included medical matters so much so, that SOF medical initiatives have the potential to be looked at as benchmarks. Research done on and for Special Operators is viewed as special, not just by the armed forces, but by society as well. For this reason, it is important that SOF medical research be of the highest caliber and of the greatest scientific integrity. The SOF community is no stranger to research and is approached in every imaginable manner by government, military, and civilian research organizations interested in performing research on and for special operators. To whose benefit? After the research on SOF is published it is perceived as unique and has the potential to be looked at in the future to validate the purchase of medicines and medical devices. When government and insurance organizations reimburse for expenses, a review of the clinical literature is often required to validate the use of medications, medical equipment, and procedures. The SOF community has the potential to become a focal point when published research on Special Operators is used to validate a product or concept.

The SOF medical community should always be aware and cautious about allowing research to go on in the SOF community. We are here to provide medical support because that is what we do, but not to draw attention to ourselves as practitioners within the SOF community. It is always important to validate the need for and the legitimacy of SOF medical research. The SOCOM Biomedical Initiatives Steering Committee (BISC) vets all and funds much of the research for Naval Special Warfare. It allows other components services to share their ideas, their successes and their failures, and serves to prevent repetition and overlap.

Getting back to my point about the art of medicine, I will close by saying "Research on and for SOF warriors for research sake is not the answer. It has the potential to be a bill of goods and if left to its own devices will be self-serving. It ultimately has to be managed. All pertinent clinical research must be tempered with the notion that it will serve a medical purpose to help operators and help those charged with their medical care to do a better job. Practicing the art of medicine assures the operators are educated and have trust and confidence in those providing medical care. It is more about educating the individual in the right course than holding up research and technology as the solution."





# AFSOC



Dan Wyman, MD  
Col, USAF  
Command Surgeon



I am happy to welcome CMSgt Scott Truesdell to our AFSOC/SG headquarters staff. Chief Truesdell is our new AFSOC Command Surgeon Senior Enlisted Advisor. I have known Chief for many years and I guarantee that our Command will be blessed by his leadership. Chief Truesdell's background is as an Aerospace Medicine Medical Technician and he has vast knowledge and experience with operational medicine/deployment medicine. He comes to us from Tyndall AFB where he served as the medical group's Superintendent...thus his most recent experiences have been in the trenches delivering base level healthcare. Please do not hesitate to engage Chief Truesdell...welcome him to our command, let him know what you are doing and what your challenges are, and give him the opportunity to make AFSOC that much better...I know you won't be disappointed.

By the time you read this article, Air Force Special Operations Command Instruction 48-101, Special Operations Aerospace Medicine Operations, should be on the streets. I would like to thank MSgt Dan Arnold for making this happen! Although the title to 48-101 is "Aerospace Medicine Ops," this guidance covers several diverse topics: infection control, controlled medications, quarterly reports, deployed scope of care/quality assurance, aeromedical dispositions, immunizations, aircrew standards, dive medicine, medical surveillance, medical training, PJ medicine, PAs, operational psychology, and SOFME/CSARME responsibilities. I know that despite all our efforts, we probably don't have everything perfect in this new instruction. Please sift through all the information and let us know where we can clarify this guidance. It is imperative that everyone within AFSOC (SOF and CSAR) fully understand and comply with this instruction.

Finally, again thanks to MSgt Dan Arnold, AFSOC/SG will be sponsoring a week long conference in November at Hurlburt. After much deliberation and consultation with our medics in the field, I have decided to move and expand the AFSOC/SG breakout session that usually occurred the weekend before the annual SOMA conference in December. This was a great forum for AFSOC medics but just not enough time. So this coming November we will host our first annual AFSOC/SG conference. Like the previous SOMA breakouts, we will provide each unit the opportunity to "tell us what you're doing." Each of the AFSOC/SG divisions will also have briefings as before, but the expanded time period will allow for more comprehensive discussions as well as formal education and training. Please contact me or MSgt Arnold with your ideas and recommendations. I look forward to this opportunity to meet more of our great AFSOC medics and share thoughts, plans, and stories.

I write this as once again the Gulf Coast is preparing for yet another hurricane and the day after the bombings in London. Challenges come in many different forms throughout the world...at home and abroad, and particularly on the field of battle. I know each and every one of you meet these challenges head-on every day and excel...any time, any place! Please take care of yourself, your family, and your fellow Airmen, Soldiers, and Sailors and may God bless you and keep you safe!



## Hot New Topic



On 17 March 2005, MG Webb, Deputy Surgeon General, signed OTSG/MEDCOM Memorandum 05-004, Use of AKO E-Mail in Support of Electronic Telehealth Medical Consultation by Deployed Providers. To date, the MEDCOM implemented [id.consult@us.army.mil](mailto:id.consult@us.army.mil) (infectious disease), [derm.consult@us.army.mil](mailto:derm.consult@us.army.mil) (dermatology) and [eye.consult@us.army.mil](mailto:eye.consult@us.army.mil) (ocular) consult capabilities for all deployed DoD providers.

### BLUF:

Per the guidance of OTSG/MEDCOM Memorandum 05-004, this message announces the following AKO consult support for deployed providers:

[burntrauma.consult@us.army.mil](mailto:burntrauma.consult@us.army.mil)  
[nephrology.consult@us.army.mil](mailto:nephrology.consult@us.army.mil) (Level III+ and special cases)  
[picu.consult@us.army.mil](mailto:picu.consult@us.army.mil) (Level III+ and special cases)

**Background.** Deployed military personnel may not have adequate access to specialty care, including burn/trauma, nephrology, and pediatric intensive care expertise. AKO provides a centralized business process to manage consultation requests in a secure, timely, and consistent manner between deployed medical providers and rear-based consultants.

To obtain a consult, the deployed provider initiates an e-mail and enters an adequate description of the patient's condition and attaches images necessary to illustrate the patient's condition. Upon transmission, the e-mail is sent to an on-duty MTF specialist who will respond to the deployed provider.

The AKO teleconsultation system is not encrypted. Deployed providers should avoid sending patient identifiable information and images.

Visit the AKO Medical Knowledge Network for updates: <https://www.us.army.mil/suite/page/131414>

### SPECIAL INSTRUCTIONS:

**Nephrology:** The nephrology consultation service is limited to deployed Level III facilities, SF Medics, Independent Duty Medical Technicians, and Naval physicians at sea. Mark consultations as urgent (8 hour response) or routine (24 hour response). The initiating provider will receive an automatic reply to the consult request containing a phone number for support (current schedule below).

[nephrology.consult@us.army.mil](mailto:nephrology.consult@us.army.mil) (Level III+ and special cases)

**Pediatric Intensive Care:** The PIC consultation service is limited to deployed Level III facilities, SF Medics, Independent Duty Medical Technicians, and Naval physicians at sea. Mark consultations as urgent (6 hour response) or routine (24 hour response). The initiating provider will receive an automatic reply to the consult request containing a phone number for support.

[picu.consult@us.army.mil](mailto:picu.consult@us.army.mil) (Level III+ and special cases)

PICU Emergency Call Rotation Roster: <https://www.us.army.mil/suite/doc/1773448>

**REFERENCES** (log into AKO first):

OTSG/MEDCOM 05-004: <https://www.us.army.mil/suite/doc/1645664>

Burn and Trauma Consultation Paper: <https://www.us.army.mil/suite/doc/1773446>

Nephrology Information Paper: <https://www.us.army.mil/suite/doc/1773447>

PICU Information Paper: <https://www.us.army.mil/suite/doc/1773449>

PICU Emergency Call Rotation Roster: <https://www.us.army.mil/suite/doc/1773448>

# South American Military Working Horses Positive for Equine Infectious Anemia

Michael E. McCown, DVM

## ABSTRACT

During the spring 2004 deployment to South America, the 7th SFG(A) veterinarian, surgeon, and ODA team medics conducted a veterinary disease surveillance study. In a herd of twenty military working horses (MWH), seven animals were found to be clinically sick. Of these seven, two died and three were euthanized for humanitarian purposes. The remaining two were tested for zoonotic diseases of operational significance. This study confirmed the presence of equine infectious anemia (EIA), a highly contagious and potentially fatal viral disease, in their MWHs. This article describes the veterinary disease surveillance study, results of the tests conducted, and what impact these findings will have on future planning and mission preparedness for the 7th SFG (A). A plan for prevention through education is presented, along with treatment recommendations. Annual testing of MWHs in the 7th SFG(A) operational area is advocated.

## OBJECTIVES

1. Identify the underlying goal of conducting continual veterinary and other disease surveillance studies.
2. Describe the signs and symptoms of a horse infected with EIA.
3. Identify the testing and then treatment recommendations for EIA-positive horses.
4. Identify the primary vector and other causes for the spread of EIA.
5. Describe techniques to reduce the spread of EIA.

**Financial Disclosure:** Michael E. McCown has indicated that within the past two years, he has had no significant financial relationship with a commercial entity whose products/services are related to the subject matter of the topic he will be addressing or a commercial supporter of the educational activity.

## INTRODUCTION

The 7th Special Forces Group (Airborne) is committed to continually test and monitor for endemic and/or emerging diseases within its area of operations (AO). These diseases are critically important due to the direct impact they have on mission planning, preparation, and ultimate outcome. The underlying goal of conducting continual veterinary and other disease surveillance studies is to keep American

and host-nation Soldiers safe and the host-nation working animals healthy and functional to accomplish the mission. The 7th SFG(A) Special Forces Medics (18Ds) play a vital role in this process. They must be vigilant for and knowledgeable of endemic and/or emerging disease. During a deployment to South America in spring 2004, with 2d Battalion, 7th SFG(A), the group veterinarian, surgeon, and 18Ds

examined military working horses (MWHs) to test and monitor for endemic and/or emerging disease.

### MISSION EXECUTION

The Medical Contact Team deploys to South America April thru May 2004 to conduct a veterinary disease surveillance study on MWHs. This surveillance study consisted of physical exams and blood sample collection to test for infectious and/or zoonotic diseases. Our emphasis was to examine and collect blood from sick South American MWHs. We believe that many of the horses kept together are chronic carriers of endemic disease. These horses were examined, but blood samples were only collected from sick, or acutely infected, horses, thereby increasing the likelihood lab tests would identify an infectious and/or zoonotic disease. The blood samples were sent to the DoD Veterinary Food Analysis and Diagnostic Laboratory for analysis. With blood test results pending, treatment recommendations were made based on physical exams, signs/symptoms, and differential diagnoses.

MWHs were examined throughout South American military posts. Two acutely ill MWHs of unknown age were presented. The South American Soldiers gave an unclear history of vaccinations or prior illness. Both of these MWHs (see photos to right) exhibited anorexia, fever ( $>103^{\circ}\text{F}$ ), tachypnea ( $>20$  bpm), tachycardia ( $>44$  bpm), depression, incoordination, and progressive weakness leading to ataxia and other neurological signs (i.e., incoordination, behavior changes, hyperexcitability with excessive sweating). The white mare in the photo developed clinical signs two days prior and appeared clinically worse than the brown horse on physical exam. The brown horse's clinical signs began eight days prior to presentation and had improved slightly. Five other



Figure 1 South American MWH at Seravena. Note the thinness due to anorexia and rear end muscle wasting.

MWHs had shown similar or exact clinical signs three to four weeks prior. Three died and two were euthanized due to progressive worsening of clinical signs



Figure 2 South American MWH positive for EIA. Note sores on rear end of brown horse.



Figure 3 South American MWH positive for EIA



Figure 4 South American MWH at Seravena. Note the effects of anorexia and difficulty standing.

over a one to three week period. The rest of the 20-horse herd, including two foals, did not display any clinical signs. These horses were purchased by the South American military from locals and most, there-



fore, had unclear clinical histories. Preventive medicine history, to include vaccination and deworming, was not known. The husbandry practices had some problems. Equipment (i.e., clippers, etc.) was used on every horse without being disinfected. Most of these horses had open lesions and serous secretions on their backs due to saddle sores and in other areas due to clipper nicks. The saddle pads absorbed this serous secretion and were used on different horses without being cleaned. Serum and blood transfer from horse to horse occurred with both of these practices. Additionally, the horses were housed in open stables near standing water, which led to the overabundance of mosquitoes and other blood-feeding flies.

Based on clinical signs and the MWHs' unclear clinical histories, the differential diagnoses included EIA, *Venezuelan equine encephalomyelitis* (VEE), *Eastern equine encephalomyelitis* (EEE), *Western equine encephalomyelitis* (WEE), rabies, tetanus, and botulism.

Our initial response was to immediately isolate the sick horses from the rest of the herd. General supportive care was then recommended to the South American working horse unit. Blood samples were collected from both horses, and blood smears were made. The blood samples and smears were sent to the DoD Laboratory for analysis.

## RESULTS

Both the Agar-Gel Immunodiffusion (AGID) or Coggins test and the Enzyme-Linked Immunosorbent Assay (ELISA) test confirmed the presence of EIA virus in the sick MWHs. The horses tested negative for West Nile Virus and WEE. However, the lab was not able to obtain positive controls for the VEE and EEE tests. Therefore, neither a positive nor a negative VEE or EEE result could be definitively concluded.

## DISCUSSION

*Equine infectious anemia* (EIA), also known as "swamp fever," is an acute or chronic viral disease of horses. Although related to the human deficiency virus (HIV), EIA is not known to infect man. The virus is found in blood, discharges, and all tissues in acute EIA cases. In chronic cases, the virus persists in the white blood cells (WBCs) of infected horses for life. Transmission occurs as blood cells or serous discharges are transferred from infected horses. Hypodermic needle insertion and withdrawal may provide adequate viral transmission. EIA is primarily transmitted by blood-feeding tabanids (i.e., horseflies and deerflies) and may be spread through other biting

insects or contaminated vectors (i.e., surgical instruments, clippers). Additionally, EIA-positive mares have been shown to infect their foals in-utero.

The three stages of EIA are acute, chronic, and inapparent. Horses exposed to the EIA virus may develop severe, acute signs of the disease and may die in two to three weeks. One-fifth of a teaspoon of an acutely infected horse's blood contains enough virus to infect one million horses. Those horses that recover will be identified by the Coggins test. The horse with chronic EIA is the classic "swamper." This horse is anorexic, lethargic, and may display recurring clinical signs. One-fifth of a teaspoon of a chronically infected horse's blood while febrile contains enough virus to infect 10,000 horses. Most of the horses are inapparent carriers and have substantially lower virus concentrations in their blood. These horses show no clinical signs but may become chronic or acute due to stress or the presence of other disease(s).<sup>1</sup>

EIA clinical findings, findings an 18D may see in the field, include anorexia, depression, weakness, progressive weight loss, intermittent fever, petechial hemorrhages on mucous membranes, and progressive anemia (displayed as pale mucous membranes, irregular heartbeat, and/or a jugular pulse on physical exam). The 18D may make a presumptive diagnosis based on clinical findings, presence of biting insects and/or blood-feeding flies, and poor husbandry practices such as those described previously. Definitive diagnosis is by the serologic immunodiffusion or Coggins test. Currently, there is no vaccine available, and general supportive care is the only treatment, helping in individual cases. When an EIA diagnosis is confirmed, the infected horse should be segregated and isolated from the rest of the herd. Humane euthanasia is recommended to prevent any potential virus transfer. Control of biting insects and blood-sucking flies is paramount in the prevention of EIA transmission. This may be accomplished by repeated spraying and by screening open stables to prevent access of blood-feeding flies. Fly-traps and fly-paper will also help to control flies that gain access to the interior of the stables. Standing water near stables should be treated or filled in. Stables should not be built near ponds, swamps, or low lands. These areas provide ideal mosquito breeding habitats, which provide one of the primary vectors implicated in the spread of EIA. Additionally, equipment that causes skin abrasions or absorbs serous secretions should not be used or be disinfected prior to use.

Important to mention are the inconclusive test

results for VEE and EEE. The DoD Lab reported these results were negative yet a slight chance remained due to test reagent concerns and the inability to obtain positive controls. These diseases are important to 7th SFG(A) due to the fact that they are endemic to the AO and are zoonotic. Therefore, the presence of VEE, EEE, or even WEE is a concern for 7th SFG(A) and host-nation troops at these specific sites and at every outstation. Clinical signs for these viral diseases in man can vary from mild flu-like symptoms to death. If present in the area, the immunosuppressed, elderly, and young are the most susceptible. People displaying neurologic signs due to infection with these viral diseases usually have persistent neurologic problems post recovery. Interesting to note is that human disease usually follows equine infections by one to two weeks. Prevention is the best control measure. Specifically, applying repellants (i.e., DEET) and wearing clothing to cover exposed skin, standard personal protective measures (PPM), are critical. Environmental pesticide application and destroying biting insect and blood-feeding fly habitats are also important preventive measures.<sup>2</sup>

## CONCLUSION

The impact of finding an infectious disease in South American MWHs will affect future planning and mission preparedness for the 7th SFG(A) units deploying to South American. As part of the future planning process, we must now determine the next course of action or plan.

Our plan will focus on prevention through education. The 18Ds will be trained by group medical providers to conduct awareness and prevention training to the South American Soldiers. The bottom line is preventing the spread of EIA involves eliminating or minimizing the transfer of secretions and blood between horses. This is best accomplished by testing and segregating EIA-positive horses at a safe distance from EIA-negative horses.

The EIA-positive MWHs should receive general supportive care and symptomatic treatment. IV fluids may be given as needed. For fever or pain, administer flunixin meglumine (Banamine®) at 1.1mg/kg IV or IM (injectable) or 1.1mg/kg PO (oral paste) once daily for up to five days.<sup>3</sup> These horses should be humanely euthanized by a veterinarian if clinical signs worsen to the point of being inhumane and recovery is not expected. Horses that do recover from clinical disease will be chronic shedders and

must be isolated from the other horses.

Because there is no vaccine or cure for EIA, the South American MWH personnel must begin an annual testing program with the Coggins test. When new horses are brought in to the unit, they must be segregated and tested for EIA and other diseases prior to housing them with the rest of the herd. Until all horses are tested, it should be assumed that each might be a carrier of EIA or other infectious and/or zoonotic disease. By initiating an annual testing program, the MWH units will ensure the horses' health and performance. Quick response when infectious and/or zoonotic diseases are confirmed will prevent catastrophic losses for these units.

The 18Ds can continually educate and monitor South American MWH personnel to ensure the following precautions are taken to reduce the risk of infection:

- ◆ Use disposable needles and syringes.
- ◆ Clean and/or sterilize equipment and instruments after each use, especially those used on multiple horses.
- ◆ Ensure stables and facilities are clean and sanitary.
- ◆ Initiate an insect control plan, such as spraying with approved insecticides and ensuring standing water is dealt with promptly.
- ◆ Isolate all new horses until they are tested.<sup>1</sup>

Our plan will serve four primary goals or purposes: (1) To increase the safety and awareness of American and host-nation Soldiers in regards to endemic or emerging infectious and/or zoonotic diseases. (2) To improve the health and performance of the South American MWHs through testing and preventive medicine programs. (3) To take advantage of a great rapport-building opportunity. (4) To integrate this report's findings into future Special Forces/Civil Affairs medical and veterinary mission planning.

With this plan in place, improvements will be made in South American. Further, 7th SFG(A) will continue to conduct veterinary and medical disease surveillance studies whenever and wherever deployed.

## **"Lo Que Sea, Donde Sea, Cuando Sea"** (**"Anything, Anyplace, Anytime"**)

**Historical Note:** EIA is historically significant in four ways: (1) It's the first horse disease proven to be caused by a "filterable virus" or one that can survive special lab filtering procedures and remain infectious. (2) It's the first retrovirus-induced disease proven to be transmitted by insects. (3) It is the first persistent virus for which antigenic drift was defined. (Antigenic drift is the virus' ability to change

its form enough so that it's no longer vulnerable to existing antibodies.) (4) It is the first retrovirus-induced disease for which a diagnostic test was approved.<sup>1</sup>

#### BIOGRAPHY

CPT McCown is a graduate of the University of Florida College of Veterinary Medicine. He enlisted in the



U.S. Army in 1993 and obtained a commission in 2001. He is currently assigned as the Group Veterinary Surgeon, 7th SFG(A), Fort Bragg, NC. CPT McCown is also the 7th SFG(A) Group Med Training Officer-in-Charge (OIC) responsible for the group medical training, with 18D sustainment training as its primary focus. He will be the Combined Joint Special Operations Task Force (CJSOTF) Veterinary Surgeon while deployed in support of Operation Enduring Freedom (OEF).

**EDITOR'S NOTE:** Editorial to Military Working Horses Positive for Equine Infectious Anemia in South America written by Michael E. McCown, DVM

The blood test for EIA, commonly called a Coggins test, was developed in 1970. Prior to the advent of widespread testing, it is reported that thousands of horses died each year from EIA. Outbreaks of EIA even impacted Army Remount stations. Since that time, through testing and subsequent euthanasia or isolation of those horses with EIA, the numbers of horses testing positive for EIA

has dropped. In 2004, of the 2,013,376 horses tested (out of an estimated 6.6 million horses in the U.S.), only 333 were positive (0.017%).

Each state in the U.S. establishes its own laws regarding EIA testing. Most now require a Coggins test within 1 year for horses being sold or transported. A negative Coggins test is required to move horses across state lines. The "backyard" horse owner is also encouraged to have their horses tested yearly to help limit the spread of this disease. Due to the decrease in prevalence of EIA, many veterinarians have not seen nor will ever see a case of this disease.

EEE, WEE, VEE, and the West Nile virus also impact the U.S. horse population. Fortunately, vaccines are available for these diseases and have good efficacy when used properly. Unfortunately, due to economic reasons, other countries often do not practice the same level of animal husbandry as the U.S.. This is something to keep in mind whenever traveling in another country and dealing with the local domestic animal population.

Capt Deborah Parsons, USAFR, NC

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**A special thanks to all of the medics and the 7th SFG(A) personnel that assisted in this project.**

**A very special thanks to Mr. Ed Cooper and the rest of the DoD Veterinary Food Analysis and Diagnostic Laboratory for blood sample testing/analysis.**

# Army Ranger Casualty, Attrition, and Surgery Rates for Airborne Operations in Afghanistan and Iraq

Russ S. Kotwal, MD, MPH; David E. Meyer, MD; Kevin C. O'Connor, DO; Bruce A. Shahbaz, MA; Troy R. Johnson, MD; Raymond A. Sterling, PA-C, MPAS; and Robert B. Wenzel, MD

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## ABSTRACT

Although numerous articles have been published documenting parachute injuries, a search of the medical literature revealed none that detail casualty, attrition, and surgery rates for airborne operations conducted into actual combat. This study examines observed airborne casualty, attrition, and surgery rates in U.S. Army Rangers during combat operations in order to identify risk factors attributed to static-line parachute injuries and provide a comparison to estimated attrition rates. **Methods:** Data were recorded on standardized manual casualty cards and tracking forms while treatment was provided during two missions into Afghanistan during Operation Enduring Freedom and two missions into Iraq during Operation Iraqi Freedom, and then consolidated onto an electronic database for further analysis. **Results:** There were four airborne missions totaling 634 jumpers that resulted in 83 injuries sustained by 76 Rangers (12%). Of those, 27 Rangers (4%) were unable to continue the mission and were subsequently evacuated. There were 11 Rangers (2%) who required surgery following evacuation. The overall observed attrition rate differed from the estimated rate ( $p = 0.04$ ). Although observed attrition rates did not differ from estimations in Afghanistan ( $p = 0.75$ ), attrition rates in Iraq were greater than estimated rates ( $p = 0.02$ ) and observed rates in Afghanistan ( $p = 0.05$ ). **Discussion:** Many factors impact casualty, attrition, and injury patterns. Terrain and equipment load were notable associations analyzed in this study. **Conclusions:** Medical, logistical, and operational personnel can optimize support for airborne forces through improved estimation of casualty, attrition, and surgical rates. Risk factors associated with military parachuting can potentially provide further accuracy in estimating attrition and are recommended for integration into current models.

**Disclosure Statement:** The views contained herein are those of the authors and do not necessarily reflect the official Department of Defense position. The United States Special Operations Command and the *Journal of Special Operations Medicine* do not hold themselves responsible for statements or products discussed in the article. Unless so stated, material in the JSOM does not reflect the endorsement, official attitude, or position of the USSOCOM-SG or of the Editorial Board.

“Where is the Prince who can afford so to cover his country with troops for its defense, as that ten thousand men descending from the clouds might not, in many places, do an infinite deal of mischief before a force could be brought together to repel them?” The initial idea of airborne forces and verti-

cal envelopment can be traced back to this profound question posed by Benjamin Franklin in 1784.<sup>3</sup> The Department of Defense defines envelopment as “an offensive maneuver in which the main attacking force passes around or over the enemy’s principal defensive positions to secure objectives to the enemy’s rear.”<sup>14</sup>



Airborne operations are an example of vertical envelopment. The first successful static-line parachute jump from an airplane was made by Captain Albert Berry of the U.S. Army in 1912.<sup>21</sup> The first U.S. combat mission using airborne forces was conducted 30 years later by the 509th Parachute Infantry Regiment into North Africa.<sup>11,21</sup> This action would provide a foundation for all future U.S. airborne operations.

During World War II, airborne warfare tactics were created and rapidly developed, with both sides using specially trained assault forces to parachute into battle on many fronts.<sup>3,11,21</sup> Notable were the initial U.S. parachute injury rates reported at the onset of World War II, which were approximately 10 times greater than rates documented thereafter.<sup>20,27</sup> These rates most likely reflect a primitive military parachute design and the use of non-evidence and non-experience based procedures, both of which evolved considerably by the end of the conflict.

The introduction of airborne operations imposed a distinctive requirement for medical support of these specialized forces. Early and aggressive analysis of military parachuting techniques, firm understanding of the tactical employment of paratroopers, and accurate forecasting of attrition rates would be necessary to preserve the strength of this unique fighting force. Through the years, greater than 70,000 static-line parachute exits have been conducted into combat in support of more than 40 airborne operations, and crude injury rates have been collected to provide a basis for estimating personnel attrition. The Medical Course of Action Tool (MCOAT) is a deterministic spreadsheet estimation program developed to assist planners in forecasting attrition during military operations, including airborne missions, and is derived from historical observations, attrition verities and algorithms, and rates as reported by Dupuy.<sup>7,26</sup> Dupuy's method for forecasting attrition was derived from 162 World War II and 53 post-World War II (1967–1973) land battles. He determined that daytime airborne operations had a 1% attrition rate, and nighttime a 2% rate. These rates assist medical providers in estimating assets required to provide optimal support. However, a search of the medical literature revealed no published studies to date that comprehensively capture data on casualty, attrition, and surgical rates for actual combat airborne operations, and only one published manuscript documenting combat airborne injuries and attrition.<sup>23</sup>

The impact that multiple, simultaneous acute parachute injuries can have on an airborne mission can be significant. It can result in a mass casualty scenario at the very onset of a mission, regardless of the resistance of the defending force. Injuries can render a Soldier ineffective and vulnerable to both enemy and environment. Severely injured Soldiers may have difficulty maneuvering independently on the drop zone. If assistance is required, casualties can potentially reduce the combat power of an airborne assault force by displacing uninjured Soldiers from their primary mission in order to support a fallen comrade. Additionally, several Soldiers massed together around a casualty can prove to be an ample target for an opposing force.

The 75th Ranger Regiment conducts missions using special operations and light infantry tactics, techniques, and procedures to support U.S. policy and objectives.<sup>28</sup> As such, the Regiment is considered the largest U.S. Special Operations combat element, with missions that include urban combat, non-combatant evacuations, air assault raids, and airborne operations. This study evaluates static-line parachute injuries incurred by Ranger forces during four combat airborne missions, two conducted into Afghanistan in support of Operation Enduring Freedom, and two into Iraq in support of Operation Iraqi Freedom, and examines observed airborne casualty, attrition, and surgery rates, providing a comparison of observed attrition rates to rates estimated by the MCOAT.

## METHODS

### *Definitions*

A jump-related injury is defined in this study as any physical damage to the body incurred as a direct result of the act of parachuting, from the time of exit from the aircraft through the time of completion of the parachute landing fall and release from the harness on the ground, for which treatment was received from a medical officer. Injuries such as minor contusions, superficial lacerations, and abrasions requiring nominal treatment were excluded from this definition. An airborne casualty is defined in this study as any parachutist who sustained a jump-related injury which required evaluation and treatment from a medical officer, and would include fatalities if they had occurred. Casualties presenting to a medical officer in the days following an airborne mission who sustained injuries directly attributed to parachuting were included for evaluation under the definition criteria. Attrition is defined in this study as any

airborne casualty who was unable to continue the mission as a result of jump-related injuries and for whom physical assistance and timely medical intervention was required to prevent aggravation of the injury and degradation of both the individual's status and the unit's combat power. Ultimately these personnel were removed from the mission and required evacuation to the next echelon of care, resulting in a reduction of force strength on the battlefield.

### Data Collection

This study analyzes patient information stored in an electronic database maintained by Ranger medical personnel. The database was created to track real-time casualty status and to provide accurate, comprehensive updates to leaders on the status of their injured Soldiers. The authors obtained patient data directly while treating casualties on drop zones, providing in-flight care during evacuation from drop zones, and treating casualties following evacuation.

Fig. 1. Casualty card used during missions.

Standardized manual casualty cards (Figure 1) and casualty tracking forms were initially used to prospectively capture data to include patient demographics, injuries incurred, and treatment provided.

Patient information was then transferred to an electronic database as soon as time permitted within the tactical scenario. Updates were obtained indirectly from medical providers as casualties flowed through the echelons of care. To ensure the complete capture of events, patient demographics and casualty data were cross-referenced with medical records and treatment providers on return to home station. Database entries detailing injuries sustained solely as a result of parachuting were examined to determine casualty, attrition, and surgery rates incurred. Casualties sustaining blunt and penetrating trauma as a result of other causes were excluded from the data analysis.

### Setting and Conditions

Refresher training and rehearsals, parachute and equipment inspections, adjustment of equipment loads, and the wearing of personal protective equipment were all conducted in standard fashion.<sup>10</sup> Prior to each mission, training and rehearsals were conducted to review aircraft procedures, actions to be performed while in the air, parachute landing procedures, and actions to be performed once on the objective. Jumpmasters also conducted individual inspections of all parachutists to verify the serviceability, safety, and proper wear of the parachute and to confirm appropriate rigging of all mission equipment. These inspections were conducted twice—first as a detailed inspection prior to parachutists loading the aircraft and again as a brief final inspection immediately prior to parachutists exiting the aircraft. Two airborne missions were conducted into Afghanistan in the fall of 2001 (Mission 1, Mission 2) and two were conducted into Iraq in the spring of 2003 (Mission 3, Mission 4). All missions were executed at night with jumpers exiting the two side jump doors at an altitude of 800 ft above ground level. One exception to the exiting protocol was employed on Mission 3, during

## AIRBORNE OPERATIONS IN AFGHANISTAN & IRAQ—KOTWAL ET AL.

TABLE I. ENVIRONMENTAL FACTORS.

Factor	Mission 1	Mission 2	Mission 3	Mission 4
Location	Afghanistan	Afghanistan	Iraq	Iraq
Time of Year	October 2001	November 2001	March 2003	March 2003
Time of Day, % Illum*	Night, < 5% Illum†	Night, < 5% Illum	Night, 47% Illum	Night, < 5% Illum‡
Ground Elevation§	3300 ft	3300 ft	500 ft	500 ft
Ground Wind Speed¶	1 kn	5 kn	8 kn	5 kn
Temperature‡	60° F	50° F	56° F	40° F
Aircraft	C130	C130	C130	C17
Exits Used	2 Side Doors	2 Side Doors	2 Side Doors, Tailgate	2 Side Doors
Jump Altitude (AGL)**	800 ft	800 ft	800 ft	800 ft
Drop Zone	Hard/Even (Landing Strip)	Hard/Even (Landing Strip)	Hard/Even (Landing Strip)	Hard/Even/Hazards (Paved Runway)

\* Value obtained from assigned Air Force Staff Weather Officer immediately prior to each mission.

† Pre-assault fires on the objective provided additional ambient light.

‡ Targets engaged on adjacent objectives provided an additional visual cue of the horizon.

§ Approximation in feet above mean sea level obtained from topographical maps of each location.

¶ Approximate value obtained from environmental data specialist at each location.

\*\* Above ground level.

which the tailgate of one aircraft was used to dispatch equipment followed by personnel. Jumpers on Missions 1, 2, and 4 encountered low illumination at less than 5%. Mission 3 had moderate illumination at approximately 50%. Illumination estimates were obtained from the Regiment's Air Force staff weather officer prior to each mission as based on lunar data and concurrent meteorological data.

The first three missions were conducted from a C130 aircraft onto hard and even desert landing strips, with no remarkable hazards noted on the drop zone. Mission 4 was conducted from a C17 aircraft onto a hard and even paved runway with numerous innate and artificial hazards. Of note is that the man-made obstacles were deliberately constructed on and around the airfield, presumably to impede airborne forces. Ground wind speed was approximately one knot for the first mission and 5 or 8 knots during subsequent missions. Environmental factors are further detailed in Table I as obtained from an environmental data specialist located on each drop zone.

#### *Approval and Data Analysis*

Following redeployment to the United States, the authors received approval to conduct a retrospective review of patient documentation from the institutional review boards at the University of Texas Medical Branch, Galveston, TX, and the Uniformed Services University of the Health Sciences, Bethesda, MD. Patient identifiers and protected health information remained secure throughout the conduct of the study. Statistical analysis and hypothesis testing was accomplished using relative risks (RR), 95% confidence intervals (CI), and the Chi-squared ( $\chi^2$ ) test of significance or Fisher's exact test for comparisons between variables. Statistical significance was set at  $p < 0.05$ . Rates are presented as percentages rather than as a rate per thousand, consistent with attrition studies and reports prepared by Dupuy.<sup>7</sup>

#### **RESULTS**

Active duty military men assigned or attached to the 75th Ranger Regiment conducted 634 static-line exits using a parabolic T10C main parachute with the modified improved reserve parachute system. As obtained from jump manifests and personnel rosters, the number and experience level was as follows: 555 basic-rated jumpers (87.5%) with most having less than 20 prior jumps, 43 senior-rated jumpers (6.8%), and 36 master-rated jumpers (5.7%). Other demographics acquired denoted ages ranging

from 18 to 48 years and ranks ranging from private to colonel.

Details for equipment loads were obtained for each mission from the Company First Sergeants, the Operations Section, and the Regimental Force Modernization Section. Parachute equipment load, with standard weights,<sup>10</sup> was the same for all missions and included the T10C Main Parachute (28 lb) and the Modified Improved Reserve Parachute System (14 lb). Uniform and protective equipment load common for each mission included the Desert Camouflage Uniform with boots (6 lb) and Personal Protective Equipment (6 lb), which was comprised of a helmet, parachute ankle braces, elbow pads, and knee pads. The Personnel Armor System Ground Troops Helmet was worn for Missions 1 and 2 and the Modular Integrated Communication Helmet was worn for Missions 3 and 4. Additionally, the Joint Lightweight Integrated Suit Technology with M40A1 Protective Mask (10 lb) was worn for Missions 3 and 4. Mission equipment load, with measured weights for dictated and standardized packing loads, was obtained from an average of random sampling prior to each mission. Common to each mission was the Ranger Assault Carrying Kit (30 lb) and M1950 Individual Parachutist Weapon Carrying Case with M4A1 Carbine Weapon System with standard special operations' peculiar modifications and 30-round magazine (16 lb). Select individuals carried other weapon systems; however, a comprehensive report on each weapon system is beyond the scope of this study. Mission equipment varying between missions were the Assault Pack worn for Mission 1 (47 lb) and Mission 2 (43 lb) and the All-Purpose, Lightweight, Individual, Carrying Equipment for Mission 3 (90 lb) and Mission 4 (85 lb). An average jumper weight of 185 lb is an approximate value used by the Operations Section to determine aircraft load. Thus, the average total weight for each mission was 327 lb for Mission 1, 323 lb for Mission 2, 380 lb for Mission 3, and 375 lb for Mission 4.

The ratio of medical providers to other Soldiers was approximately 1:33 and was primarily comprised of Ranger medics trained to the level of paramedic. There were one to two non-medical Soldiers per 12-man squad trained to the level of basic emergency medical technician and all Soldiers were current in first responder training. The senior medical provider on the objective for Mission 1 and Mission 4 was a physician, for Mission 2, a paramedic, and for Mission 3, a physician assistant. The

primary method for transporting casualties to drop zone casualty collection points was by Skedco® litter or manual carry. An all-terrain vehicle was air-dropped and assisted with casualty evacuation during Mission 4.

A total of 83 injuries (Mission 1 = 31; Mission 2 = 9; Mission 3 = 24; Mission 4 = 19) were sustained by 634 jumpers during 4 airborne missions. There were 7 Rangers who experienced 2 injuries each and 69 Rangers who had 1 injury each for a total of 76 casualties (12.0%). There were 27 Rangers (4.3%) who received injuries resulting in attrition, and 11 Rangers (1.7%) sustained injuries that required surgical intervention following evacuation. Trauma management teams, consisting of medical officers and paramedics, augmented aircraft platforms that evacuated casualties from drop zones. Of the 27 Rangers requiring evacuation, 19 (70%) were evacuated within 6 hours, 4 (15%) within 24 hours, and 4 (15%) within 72 hours. The third group incurred prolonged evacuation times secondary to delayed presentation and not due to a lack of evacuation assets.

The majority of the injuries, 57 (68.7%), were sustained to the lower extremities with the most injured body part being the foot for Missions 1 and 2, the ankle and leg for Mission 3, and the ankle for Mission 4. Overall, the region of the arm, wrist, and hand were least affected by injuries followed by the anterior thorax and head. Back and neck injuries were most prominent on Mission 1 and shoulder injuries on Mission 2. Figure 2 further details the

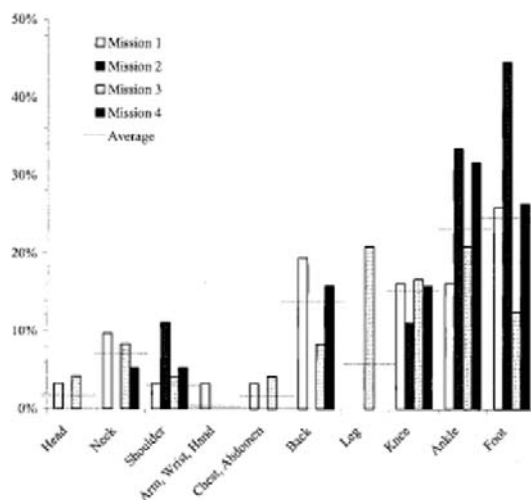


Fig. 2. Anatomical distribution of injuries by percentage of each mission's total injuries.

anatomical distribution of these injuries. No fatalities occurred as a result of these airborne missions.

Casualty rates remained relatively constant across missions except for a decrease noted for Mission 4 that approached statistical significance ( $x^2 = 3.5$ ,  $df = 1$ ,  $p = 0.06$ ). Attrition rates for Missions 3 and 4 were higher when compared with Missions 1 and 2 (RR 2.8; 95% CI, 1.0–8.2;  $p = 0.05$ ). Surgical rates depicted a trend for increased rates during Missions 3 and 4 as compared with Missions 1 and 2. However, statistical significance was not obtained from the small number of surgical injuries incurred (Fisher's exact test,  $p = 0.22$ ). Figure 3 summarizes the observed casualty, attrition, and surgery numbers and rates for each mission. No enemy fire related casualties were sustained during any of the four parachute insertions. Casualties from direct and indirect fire occurred during subsequent ground missions that are beyond the scope of this study.

## Discussion

There have been numerous studies detailing injuries in training exercises that simulate a combat environment; however, it is impossible to replicate the additional multitude of factors and imminent threat of the unknown of an actual combat operation. This is a comprehensive study of casualty, attrition, and surgery rates for recent combat airborne operations. An airborne operation is an operation involving the air movement of combat forces and logistic support for the execution of a tactical, operational, or strategic mission.<sup>9,14</sup> Fatal injuries from military parachuting occur infrequently.<sup>15,22</sup> However, many environmental and other extrinsic parachute risk factors have been identified that affect injury rates incurred during airborne operations.<sup>1,5,8,16–18,24</sup> Prior to the decision to execute an airborne mission, the commander and his staff mitigate the adverse health effects of environmental factors by avoiding potentially hazardous scenarios through meticulous planning, a detailed risk analysis, and appropriate timing. Both senior and junior leaders decrease the risk of airborne injury through management of parachutist factors.<sup>10</sup>

### Environmental Risk Factors

Condition setting influences environmental risk factors and postures an airborne force for success with minimal or tactically acceptable losses. The commander determines the exact conditions required in accordance with the factors of mission, enemy, ter-



rain and weather, troops and support available, time available, and civilian considerations, including the degree of risk a commander is willing to accept with regard to each condition.<sup>9</sup> For each of the airborne missions depicted in this study, the commander manipulated these factors to overwhelm and minimize the enemy threat and complete the mission. After enemy forces were taken into consideration, environmental factors including wind, visibility, terrain, and altitude were closely monitored as they can have the most obvious ability to substantially influence the outcome of an airborne operation. Factors involving the aircraft can also play a role.

In our study, one aircraft on Mission 3 used the tailgate to dispatch a pallet of equipment (“equipment bundle”) immediately prior to jumpers exiting. Anecdotal reports from experienced jumpers cite a protective effect resulting from a tailgate exit. In our study, jumpers exiting the tailgate aircraft incurred no injuries. A previous study that evaluated tailgate equipment bundles found an association with higher casualty rate in univariate analysis, but not in multivariate analysis.<sup>19</sup> Since aircraft exit procedures can have a direct influence on injuries incurred while exiting or in the air,<sup>16</sup> and indirectly affect injuries on impact with the ground as corrective actions taken to avoid mid-air problems can also influence landing attitude and thus potential for injury, the issue of tailgate vs. side-door exit warrants further investigation. Additionally, C17 aircraft were used on Mission 4 vs. the C130 platform used during previous missions. Although the C17 was designed to be more conducive for airborne operations, a medical literature search revealed no published studies documenting a comparison of injury rates between the C17 and C130.

Wind speeds greater than 13 knots have been noted to substantially increase the risk of parachutist injury.<sup>16,24</sup> An additional threshold for injury rates may exist for ground wind speeds of less than 5 knots. Anecdotal reports from parachutists on the minor effect of nominal ground wind speed have received some support through studies that have noted this association.<sup>1,8</sup> At very low wind speeds, a lack of lateral motion during descent may result in suboptimal parachute landing techniques. In this study, Mission 1 was conducted in wind speeds of less than 5 knots, and the other three missions were either 5 knots or 8 knots. Since all missions in our study were conducted in winds under 13 knots, the effect of high wind speed could not be effectively evaluated. Additionally, the effect of nominal wind speed during Mission 1 was not detected in our analysis.

Visibility plays an important role in parachute safety, as nighttime jumps have been extensively associated with more injuries than daytime jumps.<sup>16,24</sup> This condition of reduced visibility is the only environmental attrition discriminator denoted for airborne missions by Dupuy and used by the MCOAT,<sup>7,26</sup> essentially doubling estimation rates for missions conducted at night. For a nighttime combat airborne mission, Dupuy estimates a 2.0% attrition rate.<sup>7,26</sup> In our study, the overall observed attrition rate (4.3%) differed from Dupuy’s estimated rate ( $\chi^2 = 4.4$ ,  $df = 1$ ,  $p = 0.04$ ). Observed attrition rates (2.0%, 2.2%) did not differ from the 2.0% estimation for Missions 1 and 2 into Afghanistan ( $\chi^2 = 0.1$ ,  $df = 1$ ,  $p = 0.75$ ), reflecting the accuracy of the estimation for these missions. However, observed attrition rates for Missions 3 and 4 (5.7%, 5.6%) into Iraq were greater than the 2.0% estimated rate ( $\chi^2 = 5.9$ ,  $df = 1$ ,  $p = 0.02$ ), and were also higher when compared with Missions 1 and 2 (RR 2.8; 95% CI, 1.0–8.2;  $p = 0.05$ ) (Fig. 3).

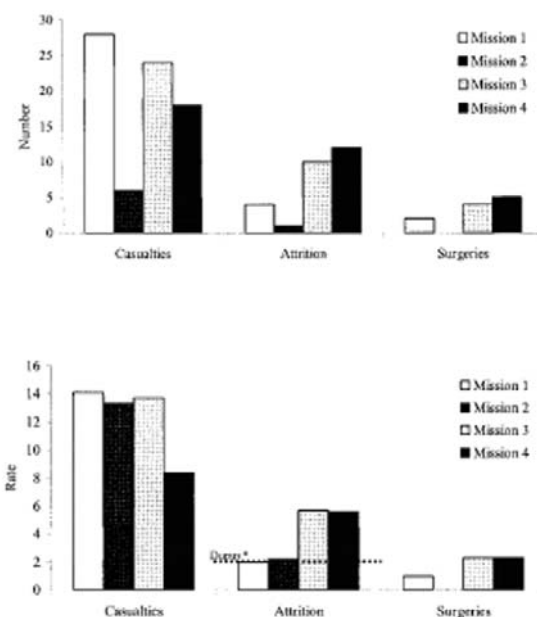


Fig. 3. Number and rate of casualties, attrition, and surgeries resulting from each mission. \* Dupuy line representing estimated 2.0% attrition rate for nighttime combat airborne missions (7,26).

Although the risk of airborne injuries has been shown to increase at night, this risk must be weighed against the potentially greater risk of conducting a daylight mission in hostile territory. The missions evaluated in this study were all conducted at night. Though it could not be directly evaluated in this study, many experienced jumpers report the perception of heightened situational awareness during missions involving low illumination when compared

with missions with moderate to high illumination.

The hazardous effect of terrain and drop zone type has been evaluated for non-combat tactical missions conducted by Army Rangers and a significant increase in all injury types was reported for missions conducted onto landing strips as compared with paved runways or fields.<sup>17</sup> Our study results were consistent with these findings. The first three missions conducted onto landing strips incurred a higher casualty rate than the fourth mission onto a paved runway with this difference approaching significance (RR 1.7; 95% CI, 1.0–2.9;  $p = 0.06$ ). The reason we did not see the expected significant difference in injury rates may have been related to the presence of manmade hazards positioned on and around the paved runway at the time of this mission. Additionally, the type of aircraft used may be another contributing factor. Mission 4 used a C17 aircraft, whereas the other missions used a C130 aircraft. Any true effect on injury rates resulting from this new aircraft platform has yet to be fully determined.

As reported by the 10th Special Forces Group (SF-10A Operation Order 00–01–Annex C; March 2004) high elevation drop zones above 5000 ft mean sea level (MSL) have been associated with stronger parachute opening shock and increased risk of injury resulting from broken suspension lines and ruptured gores (torn sections). A potential mechanism for this may be due to decreased air density at altitude, necessitating increased aircraft true airspeed with resultant increased relative wind velocity at the time of jumper exit that results in a more violent parachute opening and increased oscillation. Additionally, the less dense air may result in an increased descent rate. A significantly greater rate of injuries has also been noted at a high altitude drop zone in Kenya.<sup>19</sup> In our study, the drop zone altitudes in Afghanistan (3300 ft MSL) were notably higher as compared with the drop zone altitudes in Iraq (500 ft MSL). In spite of a previously well-described increase in injury rates during parachute operations at altitude, if altitude played a role in injury causation in our study, it could not be discerned using this particular study design.

#### *Other Extrinsic Risk Factors*

The higher attrition rates experienced during Missions 3 and 4 into Iraq as compared with Missions 1 and 2 into Afghanistan can possibly be attributed to equipment load and mission oriented protective posture (MOPP) gear. Equipment loads were an average of 50 lb greater for missions conducted into Iraq, and total parachutist weight exceed-

ed the 360-lb recommended safety threshold for the T10C parachute. If the T10C parachute is subjected to loads equivalent to or in excess of 360 lb, the parachutist will descend at a rate that is greater than the acceptable maximum of  $22 \text{ ft} \cdot \text{s}^{-1}$ , resulting in a greater force on impact. Additionally, the reserve parachute D-rings can malfunction, resulting in a sub-optimal performance from the reserve parachute if deployed. The risk of injury has already been extensively associated with equipment and weight.<sup>16,24</sup> However, the increased risk for attrition and need for surgical intervention depicted in our study is most probably due to the severity of injury that results from a greater force on impact.

Maintaining an appropriate MOPP level is essential for sustaining a combat force in a chemical environment. However, both injured and non-injured parachutists have stated that it was difficult to obtain a proper parachute landing fall position with the protective mask tied around the waist and worn anterior to the thighs. Individuals report that the mask would often displace to a location between the legs, thus preventing the proper body position for landing that includes having the feet and knees together. The weight of the anterior load would initially make relocation of the mask difficult. However, after the parachutist drops his equipment, he could more easily perform this task. Protocol dictates release of equipment at below 100 ft above ground level, which would allow 4 to 5 seconds if equipment release is initiated at 100 ft, to release the rucksack and M1950, relocate the mask, and prepare for landing. At night, and without trees or other structures for reference of height, determining the location of the ground is difficult and individuals will be less accurate with the proper timing for equipment release. Additionally, all would depend on the individual's situational awareness and priority of this factor. Thus, the mask displacement may have been a contributing factor to the increased attrition and surgical rates seen on Missions 3 and 4, but is difficult to discern.

Equipment loads should be dictated by mission requirements. In order to minimize the burden and consequences of heavy loads, only equipment and supplies required to meet the immediate needs of the assault force should initially be deployed onto the objective. Initial loads carried by the parachutist will include mission essential weapon systems and ammunition, as well as radios, water, food, clothing, and medical supplies. Any additional supplies or equipment should be phased into the objective area through airdrop or other methods of resupply. In this study,

equipment loads had a notable impact on attrition, and possibly surgical rates, during missions conducted into Iraq as compared with those conducted into Afghanistan.

The ankle is traditionally the most frequently injured anatomical region reported in parachuting.<sup>5,16</sup> However, in this study the ankle was the second most injured body part, with the foot being the most frequently injured (3.2%). Parachute ankle braces (PAB) were mandated as part of the uniform for the missions depicted in this study. Although notable that the ankle was not the most affected body part during all missions, the overall combat PAB ankle injury rate (3.0%) in our study is still significantly higher ( $p < 0.001$ ) than those reported in training jumps by Amoroso, et al.,<sup>2</sup> and Pope, et al.<sup>25</sup> These authors reported PAB ankle injury rates of 0.3% and 0.15%, respectively, and non-PAB ankle injury rates of 0.5% and 0.45%, respectively. However, our rate is significantly lower ( $p < 0.001$ ) when compared with the combat non-PAB ankle injury rate (10.8%) reported by Miser, et al., for Army Rangers in Panama during Operation Just Cause.<sup>23</sup> But, this latter study was limited by its use of a survey for data collection 3 to 4 weeks following the mission. Although the first published account of PAB use in combat, our study may not permit a meaningful statistical comparison. Nonetheless, the finding that ankle injuries make up a lower proportion of lower extremity injuries than expected could be related to use of the ankle braces, suggesting either a protective effect for ankle injuries and/or a causative effect on injuries of the foot. In this regard, further studies are necessary to establish the true effectiveness of the PAB in combat environments.

Traumatic brain injury (TBI) can result in long-term sequelae. In the military, TBI has been demonstrated to occur twice as frequently in parachutists when compared with non-parachutists.<sup>12</sup> Researchers have improved and refined devices for head protection since the advent of the M-1 steel pot. The Personnel Armor Systems Ground Troops Helmet was used for the missions into Afghanistan depicted in this study. However, the newly fielded Modular Integrated Communication Helmet was used during the missions into Iraq. The Modular Integrated Communication Helmet was developed at the Natick U.S. Army Soldier System Center and contains a highly adaptable pad suspension system that accommodates the individual user while affording improved impact protection. Even though few head injuries were seen in our study, with no detectable differences between missions and the two

helmet types worn, notable was the uncharacteristically low overall rate of head injury (0.3%) in our study vs. other head injury rates cited in the literature.<sup>5</sup> TBI may be relatively rare as compared with other parachuting injuries; it is nonetheless a cause of serious preventable morbidity and should continue to prompt improvements to head protection.

#### *Limitations in Data Categorization*

As noted in review articles,<sup>5,16</sup> the definition of an airborne injury has varied in previous studies. Airborne injury reports have defined injuries as those that receive medical treatment on the drop zone, result in restriction or loss of time from duty, require evacuation, or result in emergency room consultation or hospital admission. These definitions may take into account the most severe of injuries and many of the moderate injuries. However, these injury studies do not delineate between casualty, attrition, and surgical rates and may also not capture all injuries requiring medical resources.

To capture all injury data, one must include those injuries that present in the days following an airborne operation. These injuries can often be equal in severity to injuries that receive initial treatment on the drop zone. Individual variance in pain thresholds, temporary imperceptions of injury due to endogenous opioid release from the stress of parachuting,<sup>13</sup> and/or mission distraction may contribute to this phenomenon. However, these injuries may still require medical assets on the battlefield and should be accounted for in permission planning.

#### **CONCLUSIONS**

Since space is often limited for medical assets on initial airborne operations, and the majority of all combat deaths occur prior to a casualty receiving advanced trauma management,<sup>4</sup> an integrated team response from non-medical and medical providers must be in place in order to optimize care for a wounded Soldier. Using the principles of tactical combat casualty care as a foundation to cross-train all non-medical personnel as first responders or emergency medical technicians and providing them with the tools required to adequately treat injuries<sup>6</sup> can prove invaluable and was conducted for each mission depicted in this study.

Assessment of risk factors associated with military parachuting has the potential to provide a more accurate estimation of attrition rates, and it is recommended that these risk factors be assimilated into the MCOAT and other estimation models. In addition to



time of day, environmental discriminators for wind and terrain should be integrated into the MCOAT for airborne missions. Additionally, other extrinsic factors directly pertaining to the individual (e.g., weight, equipment load, MOPP level) should also be integrated. If the parachutist wears MOPP gear, the protective mask should be placed in an easily accessible alternate location that does not compromise landing.

Since total parachutist weight adversely affects rate of descent and appears to be a significant contributor to attrition, leaders should limit loads and researchers should continue to focus on developing lightweight and compact gear. Improvements in equipment design should also concentrate on the parachute's ability to accommodate increased loads, decrease parachutist rate of descent, and reduce impact energy, especially on drop zones at higher altitudes above MSL where rates of descent are greatest. If a new parachute system is fielded, estimation rates will need to accommodate for altered injury patterns which may result from these new parachute or equipment designs.

It is critical to anticipate all injuries that will require medical resources. An accurate estimation of these requirements is paramount in providing optimal medical care. Medical, logistical, and operational planning can be enhanced through improved estimation of casualty, attrition, and surgical rates prior to the conduct of an airborne mission. Precise estimates can ensure and optimize casualty care at the point of wounding, during evacuation, and in the provision of definitive care by supporting medical assets.

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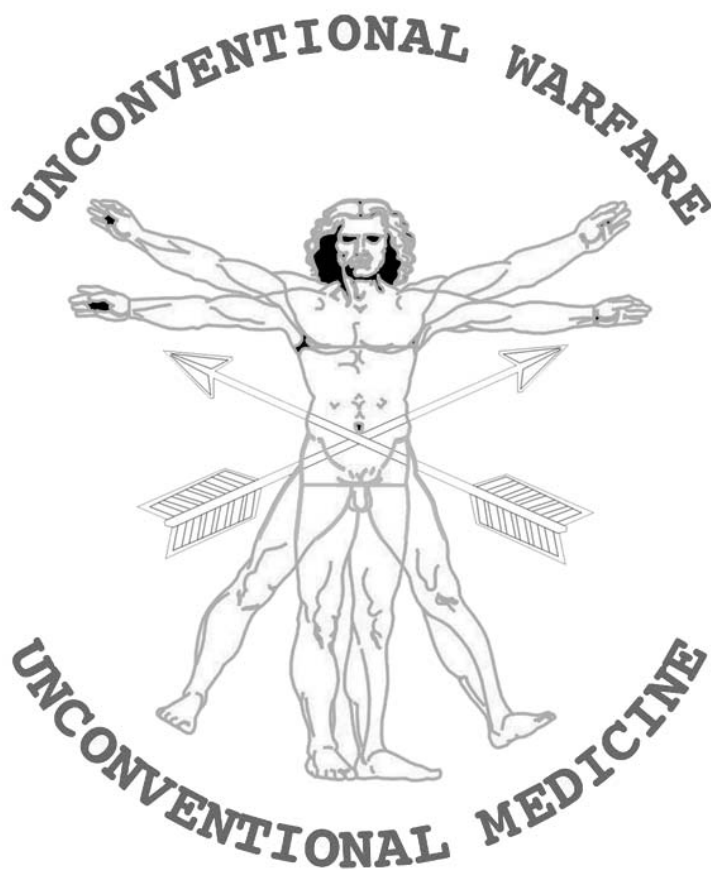
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# Prehospital Management of Head Injuries for the Combat Medic

Eric J. Chin, MD; Dan S. Mosely, MD; Troy R. Johnson, MD

## ABSTRACT

Traumatic brain injury (TBI) is very common in the combat environment. The most recent data from Operation Iraqi Freedom (OIF)/Operation Enduring Freedom (OEF) suggest 10% of casualties evacuated have TBIs.<sup>1</sup> It is associated with a significant morbidity and mortality in addition to long-term emotional, mental, physical, social, and financial impairments. Prehospital management of TBI primarily focuses on preventing the secondary insults associated with significant trauma to the brain, including hypoxia and hypotension. This is accomplished through an emphasis on evaluating and treating exsanguinating bleeding, airway, breathing, and circulation issues. These fundamentals are extremely important in the austere environment of combat medicine, where potential shortages of personnel and medical supplies, and extended transportation and evacuation times, may impair adequate care. Given the unique challenges of the combat environment and based on the current literature, we recommend the use of benzodiazepines for aborting seizure activity, prophylactic antibiotic therapy for all penetrating head injuries, and elevation of head and torso to reduce intracranial pressure in the TBI patient.

## OBJECTIVES

1. Describe the incidence of traumatic brain injuries in both the civilian and military environments and explain its significance.
2. Explain the anatomy of the cranial vault and discuss the Monro-Kellie doctrine.
3. Identify the critical assessment tools in the prehospital setting.
4. Define, explain, and discuss the factors that contribute to secondary brain injury.
5. Define, explain, and discuss the prehospital interventions that can reduce morbidity and mortality in patients with traumatic brain injury.

**Financial Disclosure** The authors reported that this presentation will include discussion of commercial products; however, they have had no significant financial relationship with a commercial entity whose products are related to the subject matter of the topic they will be addressing or a commercial supporter of this educational activity.

## INTRODUCTION

Traumatic brain injuries (TBIs) are common in both the civilian and military environment resulting in a tremendous amount of personal, financial, and societal cost.<sup>2</sup> Over the last 30 years, the survival of TBI patients transported to the hospital has increased from 50% to 75% without increasing the number of those left in a severely disabled or vegeta-

tive state.<sup>3</sup> Many studies show that head injuries are the leading cause of death in trauma victims who arrive alive at the hospital.<sup>4-6</sup> In a recent study at UCLA of 34,120 trauma registry patients, deaths from traumatic brain injury accounted for 57% of patients that arrived alive at the hospital. The vast majority of these patients survived greater than six hours after the hospital admission which means that,

in patients that survive the initial insult, sufficient time exists to intervene and potentially make a positive impact on patient outcome.<sup>7</sup> It is clear that early interventions have the most impact on the morbidity and mortality for TBIs and the potential for meaningful care during the prehospital phase of TBI management is great. This article will briefly review the pathophysiology of TBI and discuss interventions that demonstrate improved survival and outcome for the TBI patient.

## EPIDEMIOLOGY

The most recent data from the Joint Theater Trauma Registry shows that TBI accounts for 10% of casualties evacuated to level III-IV facilities during Operation Iraqi Freedom and Operation Enduring Freedom.<sup>1</sup> In Operation Desert Storm, TBIs accounted for 20% of U.S. Marine casualties requiring evacuation.<sup>8</sup> Similarly, during the war in Croatia, from 1991 to 1992, 10% of wounded persons treated at a regional hospital facility had a TBI with a mortality of nearly 40%.<sup>9</sup> On a national level, each year 1 to 1.5 million Americans sustain TBIs, resulting in 230,000 hospitalizations, and 50,000 deaths.<sup>10</sup> Some calculations estimate that in non-military populations the head injury rate is 200 to 444 per 100,000.<sup>11-12</sup> More devastating are the long-term impairments and disabilities, including loss of function, residual disability, emotional and mental difficulties, and the increased medical care needs that remain incalculable for the 80,000 to 90,000 people experiencing the onset of long-term disability every year.<sup>10,13</sup> The annual economic burden in the U.S. is approximately \$3 billion in inpatient costs of initial hospitalizations.<sup>14</sup> And with nearly 25% of TBIs resulting in long-term disabilities, including familial, social, and economic impacts, it is no surprise that an estimated \$37.8 billion was spent in 1985 for their care.<sup>10,15</sup>

## ANATOMY

The head is comprised of several layers: the scalp, skull, membranous connective tissue, and brain tissue. The scalp has five tissue layers that cover the skull: skin, connective tissue, galea aponeurotica, loose areolar tissue, and periosteum. The skin and connective tissue are highly vascular and can be the source of hemodynamically significant hemorrhage. Attention to hemorrhage control of these skin wounds should be addressed in the primary assessment. The galea is the underlying fibrous tissue layer that allows the skin to move in relation to the skull and is impor-

tant in closure of deep scalp wounds. The loose areolar tissue underneath the galea is the site for accumulation of blood in scalp hematomas.

The skull is composed of two groups of bones that form the face and cranium. Cranial bones are divided into the calvaria and base. The calvaria are composed of frontal, ethmoid, sphenoid, parietal, and occipital bones. The calvaria are especially thin in the temporal region, and in conjunction with underlying vascular structures can be a site of life threatening hematomas.

The membranous connective tissue is a covering of the brain within the skull. It is composed of three layers: a thick and fibrous dura, a thinner arachnoid layer, and the innermost pia. These layers separate the different classifications of hemorrhage covered later in this review.

## PATHOPHYSIOLOGY

TBI is divided into primary and secondary injury. Primary injury is the initial insult resulting from the physical or mechanical trauma. It occurs at the moment of impact and results in immediate damage to brain tissue and/or the cranium. The only effective intervention in primary TBI is prevention through threat mitigation (i.e., helmet use, protective barriers, etc). Secondary brain injury is the pathophysiologic response to the primary brain injury, which while physiologically intended to repair damage, may in fact worsen the injury. The environmental effects on the body that affect normal physiologic brain function also mediate secondary brain injury. These effects include such physiologic alterations as hypotension, hypoxia, hypo/hyperventilation, anemia, hypo/hyperglycemia, hypo/hyperthermia, increased intracranial pressure (ICP), direct tissue compression from expanding masses/hemorrhage, post-traumatic cerebral edema, cerebral arterial vasospasm, infections, seizures, and reperfusion injury and inflammation.<sup>3,16-17</sup>

Since the brain lacks structural rigidity, it is encased in several protective layers as described above. Within the fibrous membrane space between the brain and skull are blood vessels and cerebral spinal fluid (CSF) canals that allow movement of blood and CSF, respectively. The skull is rigid and, in conjunction with the CSF, provides a barrier to external forces. However, if the force is strong enough the skull can transmit these forces through the CSF to the brain, directly destroying or damaging underlying tissue and resulting in primary brain injury. The damage to these tissues causes inflammation and swelling and

an increased ICP. The skull, being a fixed space, prevents this increased ICP from being relieved, and can result in further brain damage.<sup>3</sup> This situation is outlined in the Monro-Kellie doctrine,<sup>18</sup> that states intracranial contents must remain constant as long as the cranial vault remains intact. A tightly controlled system of auto-regulation maintains blood flow through the cerebral arteries and arterioles providing constant blood flow over a wide range of systemic blood and intracranial pressures.<sup>19-20</sup> The body compensates for this increasing pressure with reduction in venous blood volume and intracranial CSF. However, when ICP reaches a certain level and compensation is exhausted, rapid increases in ICP occur resulting in decreased cerebral perfusion and brainstem herniation.

Optimizing cerebral perfusion pressure (CPP) is the most important priority in minimizing secondary brain injury. CPP equals the mean arterial pressure (MAP) minus the ICP. A CPP of less than 70 millimeters (mm) of mercury (Hg) after head injury has been shown to correlate with increased morbidity and mortality.<sup>21</sup>

In the combat zone, both blunt and penetrating trauma are prevalent and can present in conjunction with one another. According to the Joint Theater Trauma Registry (JTTR) report, dated 11 March 05, improvised explosive devices (IEDs) are now the number one casualty producer.<sup>1</sup> Often, these devices expose the casualty to penetrating, blunt, and blast injury in close succession. Prehospital medical management for all these casualties, irrespective of the type of head trauma, is concentrated on prevention of secondary injury, seizure, and infection control. Though penetrating head trauma is associated with poor outcomes and very high early mortality, immediate intervention with a select subgroup of these casualties can make a tremendous impact on morbidity and mortality.<sup>8,22-24</sup>

Intracranial injuries are classified by their location within the cranial vault: epidural, subdural, subarachnoid, and intraparenchymal. Though this differentiation is typically salient to the hospital provider, a brief review is warranted. Cerebral contusions and hematomas, focal bruises, and hemorrhage within the brain matter, are typically associated with blows to the head. These lead to decreased tissue perfusion and ischemia, and can result in infarction.<sup>25</sup> An epidural hematoma, hemorrhage between the skull and the dura mater, is a relatively uncommon form of TBI, accounting for <1% of head

injuries and <10% of comatose TBI patients.<sup>26</sup> This injury typically occurs with a blow to the temporal region resulting in a temporal skull fracture which lacerates the middle meningeal artery. The subsequent hemorrhage leads to a large blood accumulation between the dura mater and skull that compresses the brain. It is classically (but rarely) associated with a loss of consciousness (LOC), followed by a lucid period during which the patient may appear neurologically normal, but ultimately displays neurological deterioration. If the hematoma is surgically evacuated rapidly, these patients have a good chance for favorable outcomes.

A subdural hematoma, hemorrhage between the dura mater and the brain tissue, is the most common severe head injury, comprising 30% of TBIs.<sup>26</sup> This injury occurs from traumatic forces tearing the bridging veins between the cerebral cortex and a draining venous sinus. The blood then accumulates in the subdural space and can cause compression and swelling of the brain tissue.

A subarachnoid hemorrhage (SAH) or hematoma is usually atraumatic and due to the rupture of a cerebral aneurysm (i.e., Berry aneurysm). It classically presents with a patient complaining of the worst headache of their life. Major hemorrhage is typically preceded by a sentinel bleed several days to a week prior to a major event. A high index of suspicion and good history may enable the provider to identify this sentinel bleed and refer for corrective surgery prior the major bleeding event. It is important to note that while the SAH is classically associated with atraumatic etiologies, it is not uncommon in trauma as well.

Intraparenchymal injuries are usually due to the force of impact being transmitted to the brain itself and are associated with moderate and severe head injuries, which produce mass lesions.<sup>26</sup>

Diffuse axonal injury is thought to occur after the actual sheering forces and is due to trauma to thin long extensions of neurons resulting in sequential and focal changes several hours after the traumatic event.<sup>26</sup>

## ASSESSMENT

For the prehospital provider, the goal in trauma is to detect and correct any life threatening problems and to frequently re-evaluate the status of the patient while evacuating him to a higher level of medical care. This goal does not change for TBI patients. Of course, the initial concern for the pre-



hospital combat provider is scene safety and transitioning from the hot zone to the warm or cold zone. Once in an environment of relative safety, evaluating a head trauma patient should include the normal XABCDE (eXsanguinating hemorrhage, Airway, Breathing, Circulation, Disability, Exposure and Evacuation) algorithm. The assessment of XABC should be very familiar to the prehospital provider and will not be covered in this review. However, special attention should be given to the maintaining proper oxygenation and ventilation as well as ensuring that the patient's gag reflex is intact. This will be covered in more detail below. Several tools have been developed to evaluate and categorize the "Disability" of TBI patients. The familiar AVPU (Alert, Verbal, Pain, Unresponsive) scale is considered less favorable than the Glasgow Coma Scale (GCS).<sup>27-28</sup> Though not perfect, using the GCS to assess TBIs has been shown to be the most objective, simple, and reproducible method of documenting and following a patient's neurological status.<sup>16,29</sup> Utilizing the GCS, TBIs can be classified into severe (GCS<9), moderate (GCS 9-13), and mild (14-15), which are important for long-term prognostic information.<sup>30</sup> Other important data points for the TBI patient include a history of unconsciousness, pupillary response, and a rapid skeletal survey to assess for associated injuries. Literature has shown that loss of consciousness (LOC) increases the likelihood of an intracranial lesion. However the converse does not rule out such pathology.<sup>31-33</sup> Pupillary response may also yield useful information on the severity of injury and can portend a poor prognosis. In one study of traumatic acute subdural hematomas, unresponsive unilateral or bilateral pupils was independently associated with an 81% and 97% mortality, respectively.<sup>34</sup> Mild dilation of the pupil and a sluggish pupillary response to light may indicate impending herniation. The final assessment measure for the TBI patient is a quick check of motor and sensory function. Identification of unilateral paralysis or decreased sensory perception can aid the provider in identifying where the possible lesion may exist. A rapid way to accomplish this task is to have the patient move each extremity and then ask the patient if he feels the discrete areas of his body being examined during the skeletal survey. Any identified deficit will have to be further investigated as time permits.

Exposure and a quick skeletal survey remains critical to proper evaluation. Identification of facial lesions, lacerations, hematomas, facial trauma, rhin-

orrhea, Battle's sign, and raccoon eyes can portend to underlying brain lesions, although the last two are typically late findings. In addition, 30-59% of the time TBI patients have associated major extracranial injuries.<sup>35-37</sup> These will quickly need to be addressed in order to maximize patient outcome and minimize their effect on the TBI. Rapid transportation to higher levels of care will be imperative for patient survival and good outcome.

## MANAGEMENT

Most pathologies that determine the outcome of TBIs manifest during the first hours following the primary insult.<sup>3,38</sup> During the early post-injury period when physiologic parameters in the body cannot be maintained, *hypoxia and systemic arterial hypotension are the two most important secondary insults where effective management may have the greatest impact on the patient.*<sup>3,19,23</sup> While there is a tremendous amount of research into reversing the disruptive molecular pathways and cellular processes that are the hallmark of secondary brain injury, it is the basic approach of the XABCs that can make the most difference. These interventions should be accomplished by the prehospital provider.

Many obstacles face the military prehospital provider, including limited resources and personnel, hostile fire, an austere field environment, and extended transportation and evacuation times. Despite these obstacles, the same fundamental approach of managing XABC is critical.

At the earliest phase of treatment, the goal is to minimize factors predictive of poor outcome – hypotension and hypoxia. Many of the new diagnostic and therapeutic modalities present new risks that can potentially harm and delay definitive treatment, so careful thought should be given before implementation of any new approach to the care of TBI patients is instituted into a prehospital protocol.<sup>39</sup> While marginal benefit with some therapeutic interventions may be shown in the hospital setting, extrapolation to the prehospital environment should be weighed against the risk of delaying transport or dangerously altering the patient's physiologic response to the injury. It is important to note the civilian literature contains no clear evidence of decreased mortality with prehospital advanced versus basic life support (BLS) in managing severe head injuries; therefore it is critical to focus on the fundamentals of patient care management.<sup>40</sup>

Hypoxia rates second only to hypotension as

an independent predictive risk factor for adverse outcome and results in double the mortality (27 vs. 50%).<sup>25</sup> Oxygen delivery to the brain is paramount for maintenance of normal function and tissue viability.<sup>20</sup> An estimated 50% of TBI patients are reported to be hypoxic in the field.<sup>26</sup> Prehospital hypoxia is defined as apnea/cyanosis in the field, or a  $\text{paO}_2 < 60\text{mm}$  by arterial blood gas analysis. Hypoxia further damages the injured brain through compensatory vasodilatation of cerebral vessels and increased blood flow, potentially worsening intracranial pressure and hastening the resulting cellular damage and possibility of herniation.<sup>41-42</sup>

A first step in caring for a TBI patient involves ensuring an adequate airway to allow sufficient oxygen and carbon dioxide exchange. In a head injury patient where cervical spine (C-spine) injury is a possibility, using a jaw-thrust maneuver while maintaining the C-spine midline on the obtunded patient is an ideal first-line maneuver in airway management. Ultimately, utilization of a rigid cervical collar and backboard will be needed. A nasopharyngeal airway (NPA) may also be utilized to help prevent the tongue from obstructing air movement. This should, however, be used with caution in patients with possible skull fracture and cribriform plate disruption. If the patient is unconscious, an oropharyngeal airway (OPA) may be more appropriate.

It is widely accepted that any trauma patient unable to protect their airway will develop hypoxia and eventually result in death if no intervention is undertaken.<sup>25</sup> Patients with TBI are at increased risk for aspiration, airway obstruction from blood and vomitus, and depression of respiratory centers of the brain.<sup>16</sup> Use of an OPA or NPA is a good initial airway adjunct in the semi-conscious TBI patient, but a definitive airway is often needed to ensure proper oxygenation and ventilation. Endotracheal intubation in the field should always be carefully considered when attempting to secure the airway of a TBI patient, since it can potentially complicate a patient's condition by increasing ICP, induce aspiration, or result in an unidentified esophageal intubation.<sup>39</sup> The civilian literature evidence is mixed in regards to prehospital intubation and/or rapid sequence induction (RSI) for TBI patients, and mostly focused around previously unrecognized hypoxia during the intubation attempt.<sup>43-45</sup> Data for intubation of TBIs in a combat environment are scarce, although the austere environment and markedly increased transportation times of the prehospital combat setting makes this

intervention a reasonable adjunct to consider. Disparity between studies is attributable to variable experience of practitioners, potential increase in on-scene time, and generally poor outcome for severe TBIs despite prehospital intervention.

Ultimately, the best option is to adhere to the basic cornerstones of airway management and utilize advanced techniques only when necessary. Intubation is indicated whenever mental status depression is severe enough to result in an unprotected airway: impaired cough and gag reflexes, tongue and pharyngeal muscle laxity presenting with sonorous respirations, accumulation of secretions in the airway, or decreased responsiveness to noxious stimuli.<sup>19</sup> One civilian study on prehospital intubation demonstrated a reduction in mortality from 50% to 23% in patients with isolated severe head injury.<sup>43</sup> Data such as these must be used with caution in the combat environment, since additional factors can complicate prehospital intubation, including fewer personnel, inability to suction the airway, and inability to sedate the semi-conscious patient.

Although a noisy combat environment may preclude auscultatory confirmation, utilizing end-tidal  $\text{CO}_2$  monitors or esophageal bulbs to verify placement is recommended.<sup>27</sup> In the civilian sector, considerable debate occurs on the use of paralytics in the prehospital arena. Studies suggest that in highly skilled and trained systems, RSI can increase the rate of success of intubation, but may worsen outcome of TBI patients.<sup>44,46</sup> Additionally, the medications used in RSI can alter a neurological exam and prevent adequate monitoring for changes in a patient's status, in addition to rendering a person apneic during a failed intubation.<sup>47</sup> In spite of this, the combat environment presents a unique constellation of circumstances that may be amenable to RSI as an adjunct in those units in which the level of training for the prehospital provider is commensurate with the risks of the procedure. This is an area that deserves further investigation.

After securing the airway, the next priority becomes evaluating and maintaining oxygenation and ventilation. *The primary goal is to prevent prehospital hypoxia which can double mortality.*<sup>25</sup> In the combat environment, this is complicated by the lack of access to supplemental oxygen prior to accessing a higher level of care. Supplemental oxygen should be applied as soon as is possible. Traditionally, hyperventilation was considered the standard of care to help reduce ICP associated with closed TBIs. The generally accepted mechanism for hyperventilation is that the

resulting hypocarbia leads to cerebral vasoconstriction. However, this can have a negative effect by inadvertently reducing cerebral blood flow and increasing the area of critically hypoperfused tissue in the brain.<sup>16,41,48-49</sup> In addition, hyperventilation can create increased airway pressures which can interfere with cardiac output in a patient with preexisting circulatory compromise.<sup>47</sup> The most recent literature suggests that hyperventilating TBIs results in a significant reduction in cerebral blood flow. As such, hyperventilation is only recommended as a temporizing measure of last resort for brief periods until definitive treatment can be achieved and should be avoided in the absence of uncontrolled ICP, ICP and cardiac monitoring, or signs of obvious cerebral herniation.<sup>16,19,28-29</sup> In fact, the prehospital provider must take great care to avoid unintended hyperventilation while manually ventilating a patient.<sup>50</sup> According to the Brain Trauma Foundation's guidelines on prehospital management of TBIs, a manual ventilation rate of ten breaths per minute is recommended for adult patients after airway control.<sup>28</sup>

Once the airway is secure and adequate ventilation can be maintained, the next important goal is the prevention of shock. Shock can result from uncontrolled hemorrhage, decreased cardiac output from a tension pneumothorax, cardiac contusion/tamponade, neurogenic shock from a spinal cord injury, etc.<sup>3</sup> Circulation plays a significant role in the secondary injury mechanism of evolving brain injuries. Hypotension is a major factor in increased morbidity and mortality resulting in significant secondary brain insult leading to 150% increase in the mortality (65 vs. 27%).<sup>25</sup> A single episode of hypotension in the TBI patient results in twice the mortality.<sup>25</sup> Therefore, it is critical to assess for peripheral and central pulses and survey for any uncontrolled hemorrhage. Once the presence of a pulse is established, attempts to control any hemorrhage should be applied through maintaining direct pressure bandages and/or a tourniquet. Controlling hemorrhage is critical prior to any attempt at elevating blood pressure or restoring perfusion to vital organs.<sup>39,47,51</sup> One study even suggests that delayed resuscitation is no worse and may be better than implementing intravenous fluid (IVF) resuscitation at this stage.<sup>52</sup>

Once hemorrhage is controlled, IV fluids should be given to correct and prevent hypotension. Inadequate fluid volumes or under resuscitation can precipitate sudden hypotension, which is detrimental to successful TBI management.<sup>28</sup> Although over-

resuscitation with IV fluids may be detrimental to the trauma patient, a reasonable goal for the patient with TBI is resuscitation to a systolic blood pressure of at least 90mmHg.<sup>53-54</sup> Currently literature recommends isotonic normal saline as the fluid of choice over lactated ringer's solution, but there is growing evidence that hypertonic saline may have a role.<sup>26-27</sup> The use of alternative fluids for resuscitation, such as mannitol and albumin, remains controversial for in-hospital management, and there is a lack of convincing evidence for their utility and benefit in the prehospital setting.<sup>28,51</sup> Depending on the available resources in a combat environment, IV fluids may be limited to those that can be carried into the field. In this instance, it remains even more critical to control any major hemorrhage and evacuate the patient to a higher echelon of care where more IVF, blood products, or surgical intervention may be available.

After the XABCs of trauma have been properly evaluated and managed, it is prudent to reassess the neurological status of the patient utilizing the GCS scale and a quick neurological examination as previously described.<sup>29</sup> A deterioration of two points or more in the field portends a worse outcome, especially when assessed after correcting for any hypoxemia or hypotension.<sup>28</sup>

Further recommendations commonly cited include the use of prophylactic anti-seizure medications, prophylactic antibiotics and corticosteroids, elevation of the head of the bed, and the use of mannitol as a diuretic. Each of these recommendations will be discussed separately.

Seizures can occur in 9% of blunt and 42% of penetrating TBI patients.<sup>55</sup> Seizures cause hypoxia, hypercarbia, release of excitatory neurotransmitters, and increased ICP, which can worsen secondary brain injury. Immediate post-injury seizure activity should be controlled with benzodiazepine medications. Lorazepam (1 to 2mg IV, every 5 minutes up to a total of 4mg) has been found to be the most effective at aborting post-injury seizure activity. Diazepam (5mg IV, every 5 minutes up to a total of 20mg) and Versed (1 to 2mg IV, every 5 minutes up to a total of 4 mg) have also been shown to be acceptable alternatives.<sup>56</sup> Once the patient is stabilized, prophylactic antiepileptic drugs (AED) are often then used to limit additional seizures. Schierhout and Roberts conducted a review of ten controlled trials in which a total of 2,036 patients with acute head injury were randomized to either antiepileptic drug or control arms.<sup>57</sup> They found that using AED medications reduced the

likelihood of seizures during the week after TBI, but did not appear to benefit mortality, late seizures, or long-term neurologic function. Additionally, Chang and Lowenstein conducted a meta-analysis of 66 relevant class I and II studies and showed similar results.<sup>58</sup> Current available data support the use of antiepileptic prophylaxis as early as possible following severe TBI but the early use of AEDs in the prehospital environment has never been studied and must be weighed against the risks. The current AED of choice is phenytoin (Dilantin) at a dose of 18 mg/kg given in an infusion of 50mg per minute. Infusions of greater than 50mg per minute (2mL per minute of the standard 125mg/5ml preparation) of phenytoin can result in profound hemodynamic alterations (bradycardia and hypotension). Obviously this type of infusion can be very difficult to control in the prehospital combat environment. Other preparations of phenytoin (fosphenytoin) have been marketed which do not have as much of a profound hemodynamic effect and can be given more rapidly (100-150mg/min). This preparation, however, is very expensive and still carries similar risks of adverse side effects. While it is clear that the prophylactic control of seizures in the TBI patient is desirable in the prehospital setting, it does not appear that the use of phenytoin as a prophylactic AED is appropriate in this environment. Thus, we recommend the use of benzodiazepine medications for the acute control of post traumatic seizures, but feel that the risks of prophylactic AEDs in the prehospital combat environment far outweigh the potential benefits of such intervention.

The universal use of antibiotics in all TBI patients has recently come under scrutiny.<sup>59</sup> Data suggest that in closed head injury patients with intracranial pressure monitors, antibiotic use increases overall mortality.<sup>60</sup> Without the violation of the cranial vault and blood brain barrier, potential benefits from prophylactic antibiotics is thought to be minimal and may end up being harmful. Thus use of prophylactic antibiotics in the closed head injury patient is no longer indicated. Though a paucity of good studies exists, a clear consensus does exist with open or penetrating TBI patients. Based on a systematic review of papers on civilian and military penetrating head trauma over the past 25 and 50 years, respectively, the Working Party of the British Society for Antimicrobial Chemotherapy published guidelines for antimicrobial therapy.<sup>61</sup> Secondary to the widespread contamination of skin, bone, and hair as well as the cavitation effects of the projectile early use of broad spectrum antibiotics is recommended. We feel the use of a third generation cephalosporin, such as cef-

triaxone, or other broad spectrum antibiotic with good CSF penetration will help to reduce the infectious risk in the prehospital setting. Additional antibiotics, i.e., vancomycin, may be added upon hospital admission.

All available data clearly recommend against the use of corticosteroids in the TBI patient.<sup>62-64</sup> Use of these drugs has shown no benefit and has been associated with worse outcomes. We do not recommend the use of corticosteroids in the TBI patient.

Elevation of the head of the bed (meaning the entire torso, not just the head and neck) is a common practice in the hospital treatment of the TBI patient. While this practice has been questioned, research indicates that the ICP may be reduced by doing so while CPP and CBF are maintained.<sup>65</sup> The overall effect on morbidity and mortality is unclear, but since lowering ICP without compromising CPP can reasonably be extrapolated as a beneficial intervention, this practice can be recommended. Knowing the realities of the combat environment may make it impossible or impractical to elevate the head of the bed and the risk-to-benefit ratio must be assessed by the prehospital provider at the time of initial care and throughout the transportation process.

Mannitol has also been utilized in both the prehospital and hospital-based care of the TBI patient due to its potent diuretic effects. The prophylactic use of mannitol is not recommended in the prehospital setting due to its volume-depleting effect which may exacerbate hypotension and the other constellation of injuries seen in the combat casualty. Early use of mannitol should only be reserved for patients demonstrating signs of impending herniation.<sup>19,26</sup>

The limited resources, personnel, equipment, and a paucity of supporting research preclude the ability to utilize more advanced measures in the field management of TBIs. A plan for rapid evacuation should be made, while continuously re-evaluating the patient. Although the exact time frame for improved morbidity has not been fully elucidated, it is clear that in the combat environment a delay in evacuation of all combat casualties results in a higher mortality.<sup>38</sup> The rapid correction of acute life-threatening conditions is the only thing that should preclude evacuation to a higher echelon of care.<sup>47,66</sup> Civilian literature shows that outcomes in patients with subdural hematomas improve if operative drainage and hemorrhage control is achieved within four hours of injury.<sup>3</sup> Thus rapid evacuation to neurosurgical intervention should be the prehospital provider's driving force.



## FUTURE HORIZONS

As we have discussed here, secondary brain insult is a major cause of further brain injury in the TBI. Although there is much research into in-hospital management directed at secondary brain insult prevention,<sup>29,47</sup> prehospital research will likely continue to focus on correcting XABCs and validating current management practices. This will especially be true for prehospital RSI of head injured patients. How this applies to the prehospital combat environment is certainly up to debate. With the combination of prolonged evacuation times compared to civilian models and limited resources, civilian prehospital protocols may or may not be applicable. Careful

consideration of all interventions in the combat environment is critical to future prehospital combat protocols designed to improve outcome for TBI patients. The use and analysis of the Joint Theater Trauma Registry will be a valuable resource for military health care providers and should encourage more research in this area.

## CONCLUSION

Traumatic brain injury is very common in the combat environment. It is associated with a significant morbidity and mortality in addition to long-term financial, social, and physical impairments. Management of TBI primarily focuses on preventing

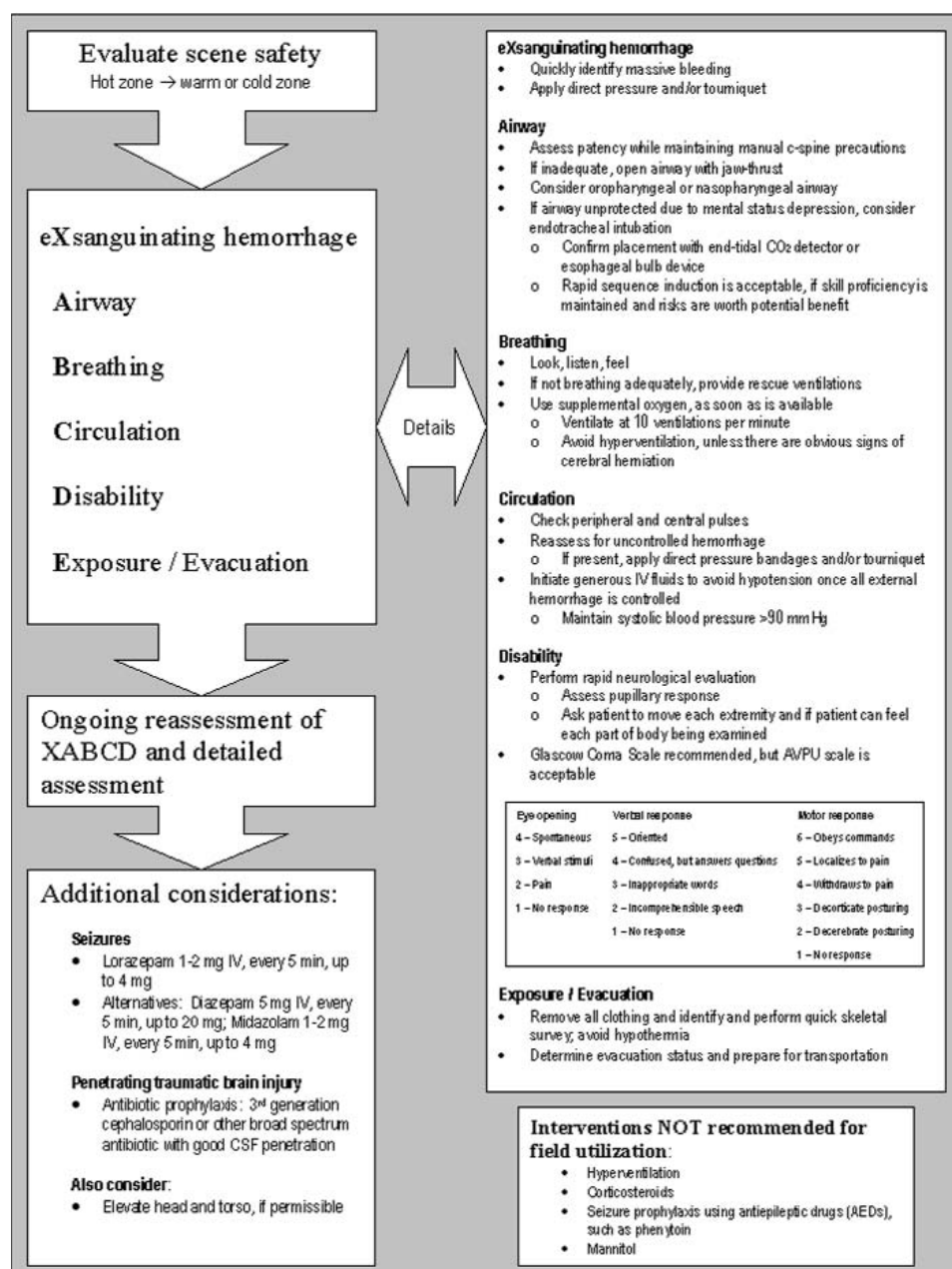


Figure 1

Recommended traumatic brain injury assessment and management. This algorithm is not presented as a protocol, per se, but rather to provide guidance for care based on the available literature and given the constraints faced by the prehospital provider in a combat environment.

the secondary insults associated with significant trauma to the brain. This is accomplished through an emphasis on evaluating and treating exsanguinating hemorrhage, airway, breathing, and circulation issues and correcting any other immediately life threatening problems. These fundamentals are extremely important in the austere environment of combat medicine, where personnel, medical supplies, and extended transportation and evacuation times are barriers to care.



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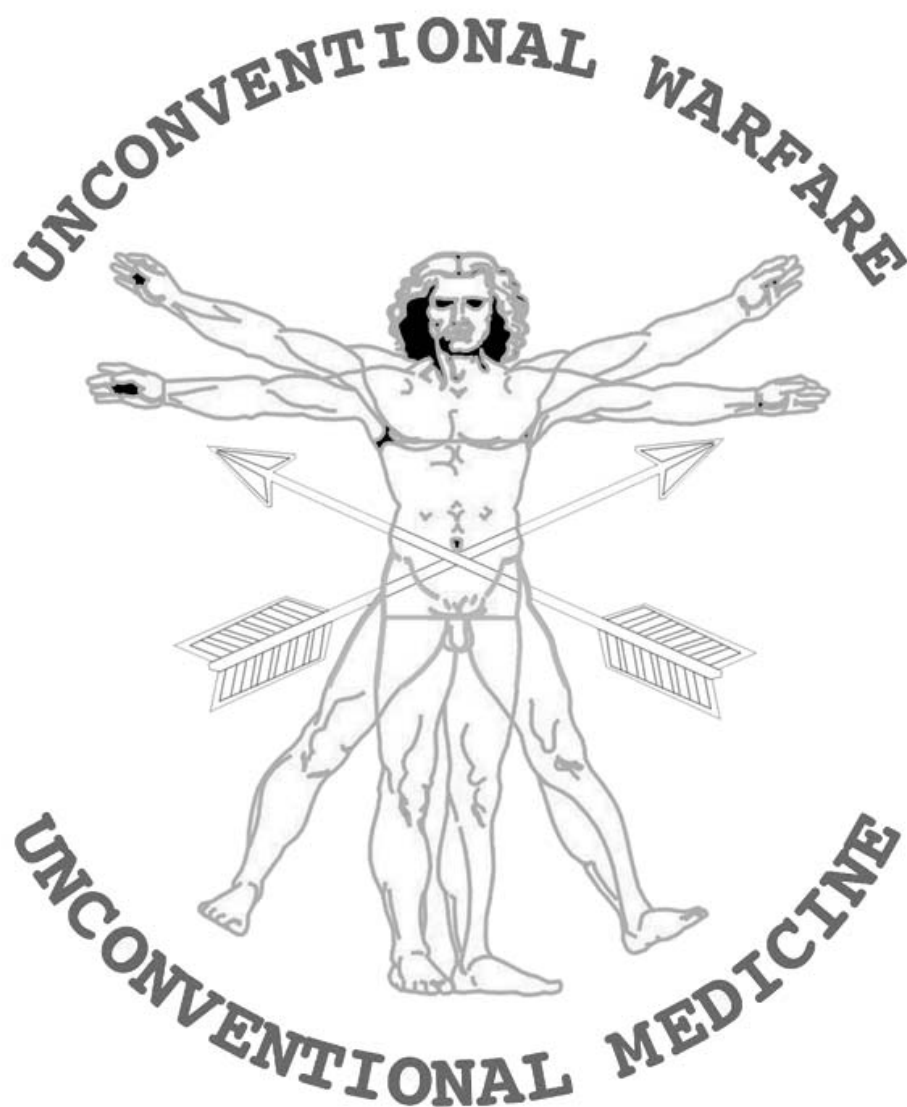
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## Patient Care: Care of the Muslim Patient

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The purpose of this article is to assist non-Muslim healthcare professionals to come to a better understanding of Islam so that they can provide appropriate and effective care to their Muslim patients.

### OBJECTIVES

1. Summarize the tenets of care for a Muslim patient.
2. Describe the dynamic interaction of the Islamic religion with the healthcare for the Muslim patient.
3. Show how to implement appropriate care for the Muslim patient.

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After Christians, Muslims form the largest religious group in the world. Islam is the dominant faith in many countries of the Middle East, Africa, and Asia, and there are minority Muslim communities throughout the rest of the world. Islam is a universal religion comprising all nationalities of the world, and makes no distinction based on color, race, or ethnicity. One must not confuse ethnic traditions and customs with Islam.

All healthcare providers may have to care for a Muslim patient at some stage. This article presents only a sketchy outline of the religion of Islam, the faith practiced by all Muslims. Readers interested in further research should contact the local branch of their State's Islamic Council, or peruse the websites listed in the bibliography at the end of this article.

### WHAT IS ISLAM?

*Islam* means maintaining peace with oneself by submission to the will of God (Islam = "to submit"). Muslims believe that all prophets from Adam to Jesus preached Islam. The preaching was completed by the Prophet Muhammad about 600 years after Jesus. Prophet Muhammad is considered the last prophet of Islam, and "the seal" of the prophets.

*Allah* is the Muslim name for God. Allah is a

word used by pre-Islamic peoples in the Middle East, and is still used by Christian Arabs today. The *Qur'an* (Koran) is the Muslim Holy Book. It was revealed in Arabic, and has remained unchanged for 14 centuries. The Qur'an concentrates on the belief in one god (monotheism), Prophet Muhammad as the last prophet, and life after death. It spells out the relationship between Allah and human beings and provides guidelines for human conduct at all times. The Muslim place of worship is the *Masjid* (mosque). Islam places the onus of practicing religion on the individual. There is no compulsion on anyone to profess the Islamic faith, and it is entirely up to the individual to adhere to the tenets of Islam.

There are over one billion Muslims across the globe, with Australian Muslims coming from more than 67 different countries. Most, but not all, Arabs are Muslims, and Arab Muslims constitute only about 20% of the world's Muslim population.

According to the 1996 Australian Census, Muslims make the largest religious group in Australia after Christians, making up 1.13% of the Australian population. More than 33% of Australian Muslims were born in Australia, with 12% of Muslims having University degrees — higher than the national average.

Muslims have had a long association with Australia, with Muslim fishermen from Indonesia having interaction with the indigenous Australians before European discovery of the continent. In the 18th and 19th century, Afghan cameleers played a crucial role in colonial exploration and development. The reliability of the Afghans and their camels was indispensable in the building of the overland telegraph line and the railway (known as the "Ghan") from Port Augusta to Alice Springs.

Islam is a religion of peace, mercy, and forgiveness, and most Muslims have nothing to do with the terrorism which has come to be associated with the faith. A Muslim is a person who submits to the Will of Allah. Islam, as outlined in the Qur'an (Allah's words) and the Sunnah (the practice of Prophet Muhammad), consists of seven articles of faith and five fundamental pillars.

#### SEVEN ARTICLES OF ISLAMIC FAITH

*Allah* is God Almighty.

*Angels* are spiritual beings created by Allah that obey his will.

*Books:* The Psalms of David, Book of Moses (Torah), Bible and Qur'an are all books of God. The Qur'an is the final, complete, and incorruptible book of God.

*Prophets:* There is a chain of prophets starting with Adam and including Noah, Abraham, Ishmael, Isaac, Jacob, Job, Moses, Aaron, David, Solomon, Jonah, John the Baptist, and Jesus and Muhammad. God's final message to man, a reconfirmation of the eternal message and a summing-up of all that has gone before, was revealed to Prophet Muhammad through the Archangel Gabriel. Muslims respect and revere Jesus as a prophet of God, and consider him one of the greatest of Allah's messengers to mankind. Adam, the first Prophet, was the father of all mankind, and so there is no justification for racial prejudice, social injustice, or second-class citizenship.

*Last day:* Muslims believe that there will be a last day when all the dead are resurrected and all the souls are judged by Allah.

*Fate:* Allah created everything with foreknowledge of its fate. The decree of what is Good and what is Evil has been predestined by God.

*Life after death:* After death, the good will live in heaven with Allah, while the evil are punished in hell.

#### THE FIVE PILLARS OF ISLAM

*The Shahadha or Declaration:* Belief in One God and in Prophet Muhammad as the last messenger of God.

One becomes a Muslim by saying and believing the Shahadha.

*Salaah or prayers:* There are five obligatory daily prayers, which are fixed sets of standing, bowings, prostrations, and sittings in worship of Allah. Prayers consist of recitation in Arabic of prescribed texts at dawn, noon, mid-afternoon, sunset, and nightfall. The direction of these prayers is the Kaaba in Mecca (e.g., west-north-west from Melbourne). It is necessary to be in a state of cleanliness or ablution (Wudhu) which means that the person and place of prayer must be free of all impurities before one can perform the *Salaah*. A person performing the *Salaah* must not be disturbed. No one should come in front of people at prayer, or attempt to talk to them. Prayers are often performed on a special prayer mat, but a clean sheet or towel will suffice.

*Ramadan* was the month in which the Qur'an was revealed to Muhammad, and so Muslims dedicate *Ramadan* to fasting and spiritual concerns. *Ramadan* is the ninth month of the Muslim calendar, which is based on the lunar cycle and does not correspond with the Western calendar. In 2002, Ramadan fell over December. Fasting in *Ramadan* (from an hour before sunrise until sunset) is compulsory for all healthy, adult Muslims on reaching puberty. It is a total fast, with abstinence from food, drink, foul language, and sexual relations. Exempted from fasting are pregnant, lactating, or menstruating women, the sick, and travelers. Those people who miss the fast make up for it when they are able.

*Zakaat:* Zakaat is the compulsory annual excise of 2.5% of accumulated wealth. This levy is used entirely for the needy.

*Hajj:* The great pilgrimage to the Kaaba in Mecca, the Hajj, is something that every Muslim must try to do at least once in life.

#### FOOD, ALCOHOL, HALAL V HARAM

Islam relates to all aspects of life. Consumption and use of daily necessities are bound by Islamic law, as revealed by the Qur'an. Pig meat and all its products (e.g., ham, bacon) are forbidden to Muslims, together with wild animals that use their claws or teeth to kill their prey, animals that are not slaughtered properly, alcohol, tobacco and other intoxicants. These items are considered haram, or forbidden.

*Halal* signifies food that can be consumed, and which has been prepared according to Islamic law. For meats, this involves the reciting of a prayer to Allah during the slaughter, in remembrance that

the animal is a creature of God. The purpose of invoking God's name is to reinforce that the animal is being killed only for human sustenance, and that the animal be blessed. This is similar to the Jewish Kosher food ritual. Muslims are allowed to eat all seafood and dairy products.

To cater for *halal* food consumers, food packaging is now increasingly making the Muslim consumer aware of the product's *halal* status.

Not only food and beverages fall within the categories of *halal* and *haram*. Products such as toothpaste, shampoo, cosmetics, soaps, detergents, and deodorants also need to be considered, since *haram* products may have been used in the production process. Individual Muslims vary in how strictly they adhere to rules of *halal* and *haram*.

#### ASPECTS OF GENERAL CARE

Good communication and open dialogue is the key to providing culturally sensitive care. If possible, healthcare should be given by people of the same sex as the patient. This has become more possible with the advent of more males in nursing, and more females in medicine. For female patients, there is an overriding objective of modesty and privacy. In some cases, a close family member of the same sex may assist in the washing of the sick person.

Muslims generally wear clothing that does not reveal the shape of their bodies. Hospital attire should be provided that meets these requirements, or if not, the patient can be advised to bring some of their own appropriate clothing.

Unnecessary touching between non-related people of the opposite sex should be avoided. The left hand is considered unclean, so it is preferred that the right hand be used for feeding or administering medications.

A beard is considered a very important religious symbol to the Muslim male patient. Like any other patient, permission must be obtained to shave any part of the beard, which should be done by a man.

A sick Muslim patient who does not have freedom of movement may perform prayers while seated or even while lying down. Healthcare providers should be aware of this and not disturb the patient at prayer.

Muslim patients may require special or additional assistance after toilet duties. It is of utmost importance that patients are given the necessary assistance to clean themselves after clearing their bowels (even in a pan). Having a jug in the bath-

room/toilet is greatly appreciated, as Muslims prefer to wash with running water after using the toilet.

The holy day for Muslims is Friday, when a patient may receive a number of hospital visitors above that normally expected.

#### BIRTH AND THE MUSLIM PATIENT

Muslims consider that a fetus after the age of 120 days is a viable baby. A miscarriage or an intra-uterine death occurring 120 days after conception requires a burial. Therefore, fetuses from such events must be given to the parents for proper burial. Abortion is permitted if the pregnancy threatens the mother's life.

After the birth of a child, some Muslim parents prefer to take the placenta for burial. It is important for a newborn child to have a prayer call recited in each ear soon after birth. It is possible that the parents may want a learned person (an Imam, Mufti, or Sheik) to perform this task.

It is a traditional religious observance to shave the head of newborn babies on the seventh day after birth, or thereabouts.

Circumcision is performed on all male children. The timing of this varies, but it must be done before puberty. The practice of female genital mutilation by some Muslims from African countries, Asia, and the Middle East is not supported by the Islamic faith. It is illegal under Australian law, and has no basis in religion.

#### DEATH, DYING AND THE MUSLIM PATIENT

Death is seen as something predestined by God. It is only the beginning of eternal life. The more pious families may thus appear inappropriately calm and accepting by Western standards. In Islam, grieving is allowed for only three days (except that a widow may grieve for 4 months and 10 days).

Because death is perceived as predestined by Allah, Muslims disapprove of any medical care that may hasten the death of a patient, even for humane reasons.

If a patient is in a coma, it is preferred that the patient be turned to face Mecca (in Australia, roughly west-north-west), with the right shoulder also being towards Mecca. It is important for Muslims to recite the Qur'an or prayers in front of the patient or in a room close by.

For a patient who has just died, the face and right shoulder of the deceased should be turned in the



direction of Mecca. The whole body of the deceased must be covered by a sheet and should be handled as little as possible. The body must be handled with the utmost respect only by a person of the same sex. A cross must never be placed on the body. The body should not be washed, as this will be done as part of a special religious ritual before burial. Muslim burials are performed as soon as possible after death, sometimes on the same day. The eyes should be closed; the lower jaw should be bandaged to the head to stop a gaping mouth. The body is then straightened and the feet are tied together.

### BLOOD AND ORGAN DONATION

Muslims accept blood transfusions and transplants of various human organs. It is acceptable for Muslims to donate blood and organs, as the saving of life is considered an act of great virtue.

### CONCLUSION

A holistic approach to care recognizes that spirituality and health are intertwined for most patients. To be able to perform an accurate assessment and provide competent and sensitive care, the healthcare practitioner must consider the patient's religious and spiritual beliefs, as well as cultural mores.



Flight Lieutenant Hyder Gulam was born in Singapore and educated in Melbourne. He is both a qualified lawyer and a registered nurse, specializing in preoperative and trauma nursing. Since September 2002, Flight Lieutenant Gulam has been posted to Headquarters Training Command - Air Force in Victoria,

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# Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report

Christopher G. Jarvis, MD

## ABSTRACT

Traumatic diaphragmatic hernia is a rare condition that can occur among Special Operations Soldiers during airborne operations. Its signs and symptoms are nonspecific and can delay the diagnosis, as in this 35-year-old Ranger. Though emergency surgery is usually not required, treatment typically involves decreased activity and strict precautions until elective surgical repair can be performed, followed by a gradual return to full activities.

## OBJECTIVES

1. Summarize the three common radiological methods used to diagnose intraabdominal blunt injuries.
2. Describe the level of recommendations for each of the three commonly used radiological examinations for blunt abdominal trauma.
3. Identify traumatic diaphragmatic hernia as a relatively uncommon, but serious, potential injury as a result of airborne operations.

The views expressed in this article are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

**Financial Disclosure:** The author reported that this presentation will include discussion of commercial products; however, he has had no significant financial relationship with a commercial entity whose products are related to the subject matter of the topic he will be addressing or a commercial supporter of this educational activity.

## INTRODUCTION

Airborne operations are notorious for producing numerous musculoskeletal injuries and concussions. The typical percent of jumpers evaluated on the drop-zone or the next day's sick-call can approach 10-15%, depending on the drop conditions.<sup>1</sup> Though the typical diagnoses made are sprains, abrasions, lacerations, contusions, and strains, occasionally more severe injuries occur, such as concussions, intracerebral hemorrhages, fractures, dislocations, derangements of the knee, and even death from blunt trauma. We must always keep in mind that all airborne operation injuries are the result of trauma and must therefore be managed per Advanced Trauma Life Support (ATLS) training and emergency medicine practices. This case report

demonstrates a relatively rare, potentially catastrophic injury as a result of trauma sustained during an airborne operation.

## CASE

A 35-year-old Ranger presented to the Battalion Aid-Station (BAS) after sustaining an injury to his left side while performing a parachute landing fall (PLF) the previous night during a mission rehearsal exercise for an airfield seizure mission. The drop conditions were a nighttime drop from 1000 feet above ground level (AGL) at an altitude of 4000 feet onto an airfield tarmac. There were no significant winds or precipitation. As a staff officer in the battalion Tactical Operation Center (TOC) for this mission, he had a combined body and rucksack

weight over 250 pounds, including a standard packing list as well as two radios and other accessory equipment. This mission was a typical mission for him, one which he had performed dozens of times before with similar loads and conditions.

He stated that he had a normal exit and descent without complications, landing on the tarmac heavily on his left side. He immediately felt pain on his left side and upper abdomen after landing, “knocking the breath out of” him. After several long seconds of catching his breath, he removed and packed his parachute, placed his rucksack on his back, and moved to the TOC assembly area. He stated that he had moderate pain initially and while moving to the assembly area. However, this pain did not limit his ability to perform the mission over the next several hours until the unit completed the rehearsal. He did not recall any loss of consciousness (LOC), headache, lightheadedness, shortness of breath after the initial injury, palpitations, nausea, or vomiting while performing the mission the previous night.

He had mild discomfort in his epigastric area and lower left chest with deep breathing and large meals. His vital signs, oxygen saturation, and lung and abdominal auscultation were normal, except for mild tenderness to palpation over his left lower chest wall and epigastrium. Specifically he had no splenic tenderness to palpation or chest, abdominal, or side bruising. An acute abdominal series was recommended but against medical advice the Ranger declined, stating that he felt okay and did not have time to go get



Figure 1 PA chest x-ray showing costophrenic haziness.

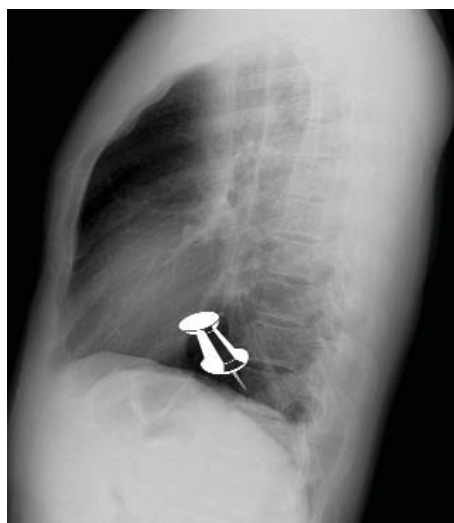


Figure 2 Lateral chest x-ray showing atelectasis.

an x-ray because the mission that night came first and he had too much planning to do and too many meetings to attend. He did state that he would not jump that night, however. His symptoms essentially resolved on their own over the next couple weeks.

Forty days later he represented back to the BAS complaining of worsening epigastric and left upper quadrant pain which was relieved with rest and antacids, but exacerbated one to two hours after eating large meals, with exercise, or with deep breathing. He denied nausea, vomiting, diarrhea, and fevers. Routine labs, including hematocrit, platelets, liver enzymes, and amylase, were normal at that time. An acute abdominal series was obtained demonstrating a normal abdominal film. The chest X-ray demonstrated atelectasis and possible haziness of the left costophrenic angle (See arrow Figure 1 and 2). Upon consultation with the



Figure 3 Axial CT chest and abdomen showing ruptured diaphragm and herniating omentum.





Figure 4 Axial MRI chest and abdomen showing ruptured diaphragm and herniating omentum.



Figure 5 Sagittal MRI chest and abdomen showing herniating omentum into thoracic cavity.



Figure 6 Coronal MRI chest and abdomen

radiologist, a routine follow-up computed tomography (CT) of the chest was ordered and performed ten days later.

The CT demonstrated traumatic rupture of the left hemidiaphragm posteriorly (See arrow Figure 3) with herniation of the abdominal fat into the thoracic cavity with adjacent segmental left lower lobe atelectasis. The Soldier was given limited duties and instructed to report to the emergency room for acutely worsening symptoms. General Surgery was immediately consulted and the Soldier seen the next day. On evaluation the surgeon recommended a magnetic resonance imaging (MRI) of the chest to further define the extent of the hernia. This had findings consistent with a diaphragmatic rupture on the left (See arrow Figures 4 and 5).

He subsequently underwent laparoscopic diaphragmatic hernia repair with primary closure of the diaphragm. The operative findings consisted of a 6cm radial tear of the diaphragm with a large amount of omentum in the chest. The diaphragmatic hernia was reduced and repaired with eight interrupted sutures. The procedure was complicated by an insufflation induced pneumothorax. This was treated with a chest tube, which was subsequently removed intraoperatively under positive pressure mechanical ventilation, removing the free air in the thoracic cavity. The Ranger recovered easily and was discharged the next day. Approximately 10 days later he deployed with the unit in support of Operation Iraqi Freedom.

## DISCUSSION

As stated earlier, the vast majority of injuries sustained during an airborne operation are the result of blunt trauma. Traumatic diaphragmatic ruptures occur in 3% to 8% of patients who survive major blunt thoracic trauma<sup>2</sup> and 1% to 6% of patients who sustain major blunt abdominal trauma.<sup>3</sup> Traumatic ruptured diaphragmatic hernias affect predominantly males (male: female = 4:1) in the third decade of life, and are often caused by severe blunt trauma (75%). Of 1,000 injuries in one study, 68.5% were left-sided, 24.2% right-sided, and 1.5% bilateral. Chest (43.9%) and splenic (37.6%) trauma were the most common associated injuries with diaphragmatic hernias. The diagnosis was made preoperatively in 43.5% of cases, whereas in 41.3% it was made at exploration or at autopsy, and on the remaining 14.6% of the cases the diagnosis was delayed, as in our case. The mortality was 17% in the acutely diagnosed, usually due to other associated abdominal and chest injuries, and pulmonary complications encompassed the majority



of the morbidity associated with the subsequent surgical repair.<sup>4</sup> Blunt abdominal trauma is the leading cause of morbidity and mortality among trauma victims, but the clinical evaluation of these patients remains controversial. In February 2004, the American College of Emergency Physicians issued a clinical policy for the evaluation of blunt abdominal trauma.<sup>5</sup> The following discussion will highlight the diagnostic procedures available to the physician in the evaluation of acute blunt abdominal trauma and their levels of evidence. The discussion of diagnostic procedures used in the evaluation of the latent phase diaphragmatic hernia will only be mentioned cursorily.

The abdomen is thought of as a “black box” when it comes to evaluating blunt abdominal trauma, especially in the patient with altered mental status. In one large study it was found that 19% of blunt abdominal trauma patients with intraabdominal injuries had no tenderness on exam.<sup>6</sup> As such, the physical exam of the abdomen is notoriously inaccurate in blunt trauma and necessitates rigorous testing to rule out intraabdominal pathology. The detection of traumatic diaphragmatic hernias with plain chest radiography alone is limited, with a sensitivity of 46% for left-sided rupture.<sup>7</sup> Since 1965, the diagnostic peritoneal lavage (DPL) has been used to identify hemoperitoneum, but it cannot identify any abdominal injury not associated with significant hemoperitoneum, such as an isolated diaphragmatic rupture.<sup>8</sup> Since the early 1980s, CTs have been the mainstay for identification of hemoperitoneum, retroperitoneal bleeding, and solid organ injuries,<sup>9</sup> being less effective in identifying diaphragmatic, pancreatic, and hollow organ injuries.<sup>10</sup> In the last 10 to 15 years the focused abdominal sonography for trauma (FAST) exam has become a fixture in the evaluation of the acute blunt abdominal trauma patient.<sup>11</sup> More recently the FAST exam has been advocated as a screening tool for diaphragmatic rupture.<sup>12</sup> All of these tests are performed or are considered in the various non-standardized acute blunt abdominal trauma evaluation protocols.

#### DIAGNOSTIC PERITONEAL LAVAGE

Introduced in 1965, several studies demonstrated a sensitivity for detecting intra-abdominal bleeding approached 98%.<sup>13,14</sup> Since its introduction, it has decreased the number of abdominal trauma deaths and unnecessary laparotomies in abdominal blunt trauma patients.<sup>15</sup> A positive DPL is demonstrated by (1) aspiration of frank blood greater than 5mL, (2) red blood cell count greater than 100,000/mL after lavaging with 1L of isotonic fluid, or (3) a white blood

cell count greater than 500/mL in the lavage fluid.<sup>16</sup> This procedure is taught in ATLS, but DPLs are limited by their lack of specificity for which organs are injured and to what extent.<sup>11</sup> Therefore, they are rarely used except when other more informative tests are not available.

**Level B recommendation:** Diagnostic peritoneal lavage can be used to exclude hemoperitoneum in blunt abdominal trauma patients. Diagnostic peritoneal lavage does not define the extent of injury, has a 1% to 2% complication rate, and may lead to nontherapeutic laparotomies.

**Level C recommendations:** On the basis of consensus and current practice patterns, the initial choices for the evaluation of blunt abdominal trauma are CT and FAST, depending on the patient’s hemodynamic stability.<sup>5</sup>

#### CT SCANNING

Though the DPL is taught in ATLS as a way to evaluate for intra-abdominal bleeding, it is rarely used now. Where available, the CT has replaced the DPL as the evaluation tool of choice for abdominal injuries based on its sensitivity of 97% and specificity 95%.<sup>11</sup> It not only provides the ability to identify bleeding, but also can identify the source of the bleeding and other organ injuries as a result of the trauma. The addition of oral contrast does not provide additional benefit in CT scanning of the abdomen after blunt abdominal trauma.<sup>17</sup> Though CTs have been excellent tools in the past, current studies and improvements in computer software and imaging protocols, such as coronal and sagittal sections as well as reconstruction techniques, have improved CT, making it a solid tool for the future in the evaluation of intra-abdominal injuries.<sup>18</sup> Organs with thin areas, such as the diaphragm and the intestines, are not readily studied with a normal CT.<sup>5</sup> Though not currently readily used to diagnose diaphragmatic injuries, recent and future advances in CT techniques will likely make it a useful adjunct in the evaluation of patients with abdominal blunt trauma for the diagnosis of traumatic diaphragmatic hernia.

**Level B recommendation:** When either liver or spleen injury is suspected, CT can reliably exclude injuries that require emergent operative intervention. CT alone cannot be used to exclude either bowel, diaphragm, or pancreas injury. Abdominal CT accurately identifies hemoperitoneum among patients with blunt abdominal trauma. Oral contrast is not essential to the evaluation of blunt abdominal trauma.<sup>5</sup>

## FAST Exam

The FAST exam is taught concurrently with the DPL in ATLS and depending on available time, resources, and the clinician's level of experience, is the preferred technique by some authors for the rapid evaluation for hemoperitoneum following abdominal trauma. It has an operator dependent 68% to 91% sensitivity and 98 to 99% specificity for intra-abdominal injuries resulting from blunt trauma, with specificity and sensitivity reaching 100% in hypotensive patients.<sup>12</sup> The procedural complications associated with a DPL are non-existent for a FAST exam.<sup>14</sup> The FAST exam uses ultrasound to visualize Morrison's pouch (i.e., the right upper quadrant), the splenorenal recess (i.e., the left upper quadrant), and the pouch of Douglas in the pelvis, looking for evidence of hemoperitoneum. The presence of fluid in any of these locations suggests possible blood and necessitates further radiological evaluation or a laparotomy.<sup>5</sup> Many emergency sonologists take the FAST exam one more step and look above the diaphragm, evaluating for a hemothorax. Given that they are already at the diaphragm level when looking in the thorax, several authors have suggested using the FAST exam to evaluate for a ruptured diaphragm. Ultrasound findings observed by these researchers include obvious diaphragmatic defects, lack of diaphragmatic movement or abnormal movement, and decreased detection of diaphragm motion with respiration utilizing ultrasound m-mode. The same authors recognize the limitations of their data and are calling for further evaluation in this area.<sup>12</sup> Of note, this evaluation is extremely difficult when the patient is intubated and being mechanically ventilated due to the lack of diaphragmatic contraction.<sup>20</sup> Though the usefulness of the FAST exam in the evaluation of the patient with acute abdominal blunt trauma is well documented, more research is needed in its abilities to detect the traumatic diaphragmatic hernia in these cases.

**Level B recommendation:** FAST is useful as an initial screening examination to detect hemoperitoneum in blunt abdominal trauma patients.<sup>5</sup>

In the treatment of acute phase diaphragmatic injuries the best approach is through the abdomen, since more than 89% of patients with this injury have associated intraabdominal injuries. Patients with diaphragmatic rupture presenting in the latent phase frequently have adhesions between the herniated abdominal contents and intrathoracic organs, and thus the rupture is best approached via a thoracotomy.<sup>4</sup> Even

though our case involved a latent presentation, the general surgeons felt comfortable doing this surgery via a laparoscopic approach due to the relatively small herniation involved, and this approach is supported in the literature.<sup>21</sup>

## CONCLUSION

The diagnostic techniques employed are different in the acute and latent phases following trauma. In the acute phase surgical procedures are often emergently necessary and will demonstrate diaphragmatic hernias in up to 5% of cases.<sup>11</sup> If the patient has severe injuries one should often rely on bedside examinations such as the chest x-ray and FAST exam. Special attention should be given to the basal lung fields and diaphragm as atelectasis or other minor lung changes may be all that is seen to suggest a diaphragmatic injury, as it was in this case. In latent phase blunt abdominal trauma, chest and abdominal x-rays, fluoroscopy, ultrasound, standard, reconstructed, and spiral CT, and MRI are all advocated for the diagnosis and evaluation of diaphragmatic hernias.<sup>22</sup> As always, do not delay proper consultation and emergency surgery in the unstable patient in order to obtain these advanced radiological evaluations.

Understand that traumatic diaphragmatic hernias are difficult to diagnose and are often missed. The rate of missed diaphragmatic injury or rupture in trauma patients managed non-operatively is estimated to range between 12% and 60%.<sup>23</sup> Therefore, medical personnel who care for airborne operators must consider the diagnosis in anyone with blunt abdominal trauma as a result of a jump. The usefulness of the DPL in making this diagnosis is limited, while those with FAST exam training may be able to make this diagnosis prior to a CT in the acute phase

In the 18 years of airborne operation medical coverage of the Battalion physician assistant and the four years of similar coverage by the author, this diagnosis had never been made on any previously injured Soldier, nor has it been reported in the literature, making it a relatively rare injury in our community. That being said, the potentially catastrophic consequence of this injury makes it necessary for medical providers who cover airborne operations to consider this in their differential diagnosis of the acute abdominal injury sustained after a jump. Though there is no standard evaluation algorithm for this type of injury, I hope that the options and evidence presented above will help in the evaluation of similarly injured operators in the future.

**Level A recommendations:** Generally accepted principles for patient management that reflect a high degree of clinical certainty (i.e., based on “strength of evidence class I” or overwhelming evidence from “strength of evidence class II” studies that directly address all the issues).

**Level B recommendations:** Recommendations for patient management that may identify a particular strategy or range of management strategies that reflect moderate clinical certainty (i.e., based on “strength of evidence class II” studies that directly address the issue, decision analysis that directly addresses the issue, or strong consensus of “strength of evidence class III” studies).

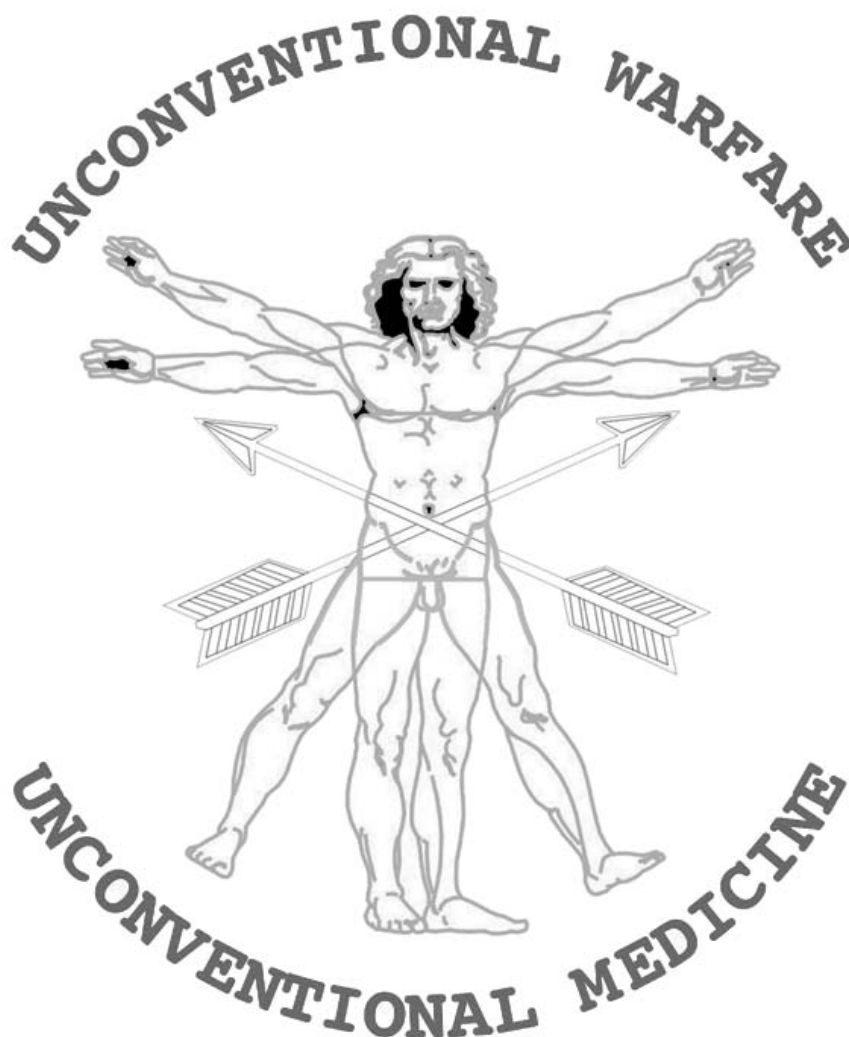
**Level C recommendations:** Other strategies for patient management based on preliminary, inconclusive, or conflicting evidence or, in the absence of any published literature, based on panel consensus.

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# Medical Contributions to Unconventional Warfare

John Kyle Hill, 18D; Brent Hale, MD; James C. Post, MD; John Trent, PA

## ABSTRACT

A classic SOF mission provided healthcare to citizens in an unconventional warfare (UW) setting. During a ten-month period, over 18,000 local national patients in one country were evaluated with diseases and injuries ranging from parasites to gunshot wounds. This article discusses the medical contributions to UW. Medical care generates goodwill among the local population, while medical civilian action programs (MEDCAPs) provide an opportunity to project U.S. capabilities into remote areas. Medical contributions directly enhance the operational capabilities provided to the commander and should be regarded as tools of war. It is incumbent upon SOF medical personnel and SOF combatant commanders to understand the demands of the UW environment and to maximize the contribution of medical aspects in the UW environment.

## OBJECTIVES

1. Understand the medical contributions to unconventional warfare, including direct provision of health care to U.S. forces, shaping the operational environment by building goodwill through caring for the local population, and beginning the process of re-establishing the local health care infrastructure.
2. Identify various sources of assistance in shaping the local medical environment, including Civil Affairs and Provisional Reconstruction Teams, and potential funding mechanisms such as CERP, operational funds, and OHDACA.
3. Recognize that the primary mission is to maintain the SOF fighting strength, but also to develop a strategy of resource management to accomplish the other missions of UW medicine.

## INTRODUCTION

An unconventional warfare medical presence was established at an austere, far-forward location in Afghanistan where the missions medical personnel were multi-fold and encompassed the full range of SOF medical capabilities. Over a ten-month period, the authors supported ongoing operational missions, ran the medical facility, conducted MEDCAPs, and assessed the needs of and began the process of re-establishing the local health care infrastructure. This report records the authors' impressions of the local health care infrastructure, describes medical operations, and discusses operational aspects of UW medical care.

## LOCAL HEALTH CARE INFRASTRUCTURE

To understand the need for the full range of capabilities that UW medical assets provide, it is imperative to understand the context of the country's degraded and neglected medical infrastructure. Years of war have left only remnants of the health care infrastructure. In recent years Afghanistan provided minimal state funding for medical schools, post-graduate training programs, and preventive health care. Many local doctors can make more money as interpreters for Coalition forces or non-governmental organizations than while functioning as medical providers. The lack of functional sewage and potable water systems results in one of the highest infant

mortality rates in the world. A large percentage of the population is unvaccinated. Throughout the rural areas, women are treated as second-class citizens, leading to a great disparity between the health care received by males and females. In addition to its degraded health care system, this area also has a severely limited infrastructure. The electrical power systems are non-functional due to war, and even if the hydroelectric plants were functional, no transmission lines remain to carry power out to the surrounding villages.

A network of clinics supported by the local government and non-governmental organizations (NGOs) deliver primary health care to the province. A physician and several medical aides usually staffed these clinics. Medications purchased at local pharmacies come mostly from neighboring countries. While a notable shortage of trained medical providers exists, many villagers rely upon the expertise of the local pharmacist who blends the role of diagnostician, prescriber, and provider of medication.

The local hospital where primary care physicians and several specialists practice provides secondary health care. Since the government pays the physicians a salary equal to approximately \$35 USD per month, the physicians, in order to supplement their incomes, must also see patients in their private clinics in the afternoons and evenings. This practice led the authors to suspect that items donated by the various aid organizations could be funneled off and used in these private/for profit clinics. The tuberculosis clinic, which is well staffed, has a clear treatment protocol, and adequate medical supplies, appears to function well. The area's Ministry of Health is co-located with the hospital.

The hospital has a small laboratory, an X-ray machine, and an electrocardiogram machine. While most of the equipment dates from the Soviet occupation era, NGOs recently donated some newer equipment. Unfortunately, due to the lack of biomedical specialists and funding, most of the equipment is non-functional. Biomedical specialists in the neighboring country are reticent to come to the area to repair the equipment, even if funds were available to pay for the repairs. Although the hospital has a functional generator, its electrical power is unreliable because it often lacks diesel fuel. Patients (or their families) are expected to purchase medical supplies such as antibiotics and crystalloid intravenous fluids in the local bazaar. Within the hospital the patients' family or friends manage all aspects of inpatient care, including nursing, feeding, and housekeeping.

Tertiary health care for the area is only available at a medical school and in a neighboring country, which are a four hour or seven hour trip, respectively, by nearly impassable roads.

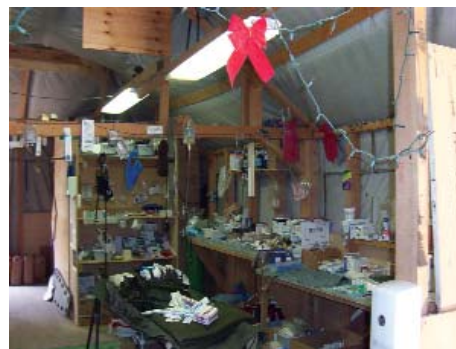
## THE BASE

The location of this medical effort was an austere, far-forward base situated adjacent to a river at the foothills of a mountain range. Originally a prison, the base was used during a previous war until it was overrun by the local fighters. SOF elements re-established the base early in Operation Enduring Freedom and developed a medical clinic designed to treat local nationals. Originally housed in a general purpose medium-sized tent, this clinic came to be known as the "Maui Clinic," named in honor of its "island" founder, SFC Kurt Schnupp. The clinic actually consisted of two separate facilities: the "lower" clinic building, used to see villagers in a "sick call" situation, and the "upper" clinic in the GP medium tent, used to treat patients needing more involved care. The local nationals appreciated the Maui Clinic so much that patients would walk for several days through the mountains and across the nearby Pakistan border to obtain care.

The success of the Maui Clinic and expansion of the base were the driving forces behind the construction of a new building with greater capabili-



Lower Maui Clinic interior (above)  
and upper Maui Clinic interior (below)



ties. Specifically designed to treat traumatic injuries for extended periods of time it was named the Speer Clinic in honor of SFC Christopher Speer, who died of wounds incurred while fighting in OEF. The building was approximately 30 by 60 feet and was constructed of adobe brick with a timber ceiling. Construction took approximately two months with labor provided by local nationals and supervision given by SOF medical personnel. To provide additional security, eight foot tall HESCO barriers separated this clinic from the operational areas of the base, thus limiting access to the base by local nationals.

The missions of the base medical personnel included: 1) Providing Level I and Level II combat health support to U.S. Soldiers and Marines, with Level III support being provided after air evacuation; 2) Providing medical and logistical support to the ODAs at the base and at two other outlying bases; 3) Conducting sick call for the ASF and local workers; 4) Providing health care for local nationals; 5) Training U.S. medics in advanced trauma management skills.

#### MEDICAL OPERATIONS ON THE BASE

Base medical personnel provided care to local nationals five days a week, since the clinic closed on Friday (the Islamic holy day) and Saturday except for follow-up care. Averages of 125 patients were seen each day, and on busy days, over 200 patients were seen. Thus, in a ten-month period well over 18,000 patients were seen. Patients would be seen starting at 0900, although they arrived several hours earlier and congregated outside the base foot traffic main gate along the road. Local Soldiers who manned the outer ring of security controlled the crowds and searched the patients before entering the base. SOF medical personnel triaged these patients in the courtyard of the lower clinic building immediately inside the gate. Several Navy corpsmen and Army medics (91W), under the supervision of a Special Forces medic (18D), physician assistant, or physician, operated the lower clinic. Patients with diarrheal diseases, musculoskeletal complaints, conjunctivitis, sore throats, scabies, intestinal parasites, skin lesions, minimal trauma, and other minor illnesses were evaluated, treated, and released. Patients with more significant injuries/illness were escorted, searched, and “wanded” with a metal detector through a second checkpoint by U.S. troops before being seen at the Speer Clinic.

The Speer Clinic was a three bed clinic with overflow capability with each station equipped for trauma resuscitation. The electrical supply for the base, developed over the years, was a mix of 120V and



Speer Clinic exterior



Speer Clinic interior

220V systems. Due to the aging generators and varying skill level of maintenance and repair personnel, power was not completely reliable. A tent accessed through the clinic stored most Class VIII supplies except for pharmaceuticals and intravenous fluids stored inside the clinic. A major asset of the clinic was a digital x-ray system that was invaluable in managing patients.

A senior noncommissioned officer, 18D, a physician assistant, and several physicians staffed the Speer Clinic. This team examined daily approximately 20 to 30 patients who suffered from a wide variety of more severe medical diseases and trauma. Common injuries included burns to children (often received when they walked into fires inside huts) and traumatic wounds suffered by locals involved in explosions from improvised explosive devices (IEDs) or landmines, gunshot wounds, and motor vehicle accidents.

Because of the limited numbers of base personnel, the expectation of quick air evacuations, and the desire to prevent local nationals from remaining on the base overnight, the Speer Clinic had a limited holding capability. However, an average of three air MEDEVACs occurred each week while three Mass Casualty (MASCAL) incidents took place each month. This workload, along with the minimum good weather response time of 1½ hours for the air evacuations,



forced the medical team to develop and implement a plan to hold patients much longer than expected. Extended holding times required a balance among the medical, operational, and security forces and mandated some degree of creativity.

#### **MEDICAL OPERATIONS OUTSIDE THE WIRE**

Because of the remoteness of the base and the limited assets of the SOF medical section, allocating resources to provide care to U.S. and Coalition forces and the local nationals posed a significant challenge. Throughout the deployment the medical section had to support large scale operations and MEDCAPs, in addition to conducting daily clinic operations. The SOF operator needs to recognize that these missions may be managed concurrently. For example, while providing medical support to a U.S. ODA during a long-range patrol the medic can simultaneously provide out of his rucksack limited healthcare to a local village child and meet with local providers to discuss the daily challenges they face while attempting to provide medical care to their own populace.

Support for combat missions such as raids and large scale operations are a specified mission of SOF medical assets. The SF Group mission included providing medical support for direct action missions. During a joint raid in the eastern part of the country, the Battalion medical assets co-located with the assault elements where they established a casualty collection point. They treated a number of U.S. and local fighters, with injuries ranging from shrapnel wounds to the extremities to open mandibular fractures. During the pre-assault, an aircraft fired on an anti-coalition militia (ACM) ordnance cache. Although explosions of rockets and heavy machine gun ammunition created a dangerous environment for evacuation, the medical team successfully evacuated multiple casualties without harm to the MEDEVAC crew.

During one operation the SOF medical assets deployed farther north to support other coalition forces (OCF) and SF elements. Due to the prolonged duration of the operation the medical elements explored more rural areas and developed relationships with the local health care providers. This allowed for development of a more complete picture of rural Afghan medical assets. These efforts culminated in conducting ad hoc MEDCAPs in a neighboring valley. The locals in the valley indicated the SOF medics were the first Americans to visit their village. This was the first of many such first-contact encounters. The team felt that it was definitely a better way for locals to meet Americans rather than by a raid.

While it is unrealistic to perform combat operations and carry the amount of medical gear required to perform a MEDCAP, the medical team found a better way to adjust to these conflicting missions. Utilizing Commanders Emergency Relief Fund (CERP) funds, they procured medications from a local pharmacy, which can be found in almost any rural village, and dispensed them directly back into the village. While these pharmacies sold a plethora of medications from neighboring countries, too few local providers had the knowledge of when and how to dispense them. Thus, when entering a village with \$200-300USD, the team could conduct medical operations while contributing to the local economy by utilizing an ancient and simple logistics operation. While forward deployed to these remote regions, the team normally spent an extended amount of time among the locals sharing meals and learning their history. The seeds of this time spent camping out of vehicles for months and performing ad hoc MEDCAPs paid dividends throughout the duration of a ten-month deployment. The medical team believed their efforts were at least partially responsible for the sharp decrease in the number of attacks on our base as well as on Coalition convoys in our area of operations.

#### **ENHANCEMENT OF MEDICAL INFRASTRUCTURE**

SOF medical assets can also evaluate the indigenous medical infrastructure, both for its potential as a treatment facility for U.S. personnel, and with a view to rebuilding or enhancing the existing structure. The medical team must coordinate these efforts with the ground commander to shape the battlefield by generating goodwill among the populace. It is important to coordinate efforts with Civil Affairs units and the Provincial Reconstruction Teams (PRTs), who may have different timelines for success. The medical team can utilize a variety of funds to help rebuild the shattered infrastructure, including Commanders Emergency Relief Fund (CERP), operational funds, and Overseas Humanitarian, Disaster and Civic Aid (OHDACA). While accessing the various funding options is complicated to a varying degree by administrative requirements, involving the correct subject matter experts early can help expedite this process.

Coordinating efforts with Civil Affairs, PRT, and other agencies can move efforts toward obtaining a sustainable funding source for local clinics and providers. Having good relationships with CA and PsyOps enhances the success of MEDCAP missions, as these organizations can help provide preventive medical education, supply resources for target audi-



ences with school supplies and wells, and shape the message the ground commander wishes to deliver.

Due to the depressed economic conditions, the salary of Afghan doctors is much less than the salary paid to translators. For less than 400 USD per month the medical team hired doctors who had attended respectable medical schools in Kabul and in Pakistan. These doctors served both as very competent translators and as talented providers to help with both clinic and “outside the wire” operations. Working with the local hospital, clinics, and doctors was educational for both U.S. and host nation personnel. This relationship made it easier to transfer patients who fell short of the “life, limb, or eyesight” evacuation criteria to the care of local Afghan providers. Hiring and/or training local providers allows medical care for the local populace to continue after U.S. medical personnel depart the area.

## DISCUSSION

One of the challenges to rebuilding the local infrastructure was the fact that cronyism and nepotism are inherent in the local culture. Progress often slowed when dealing with contractors and subcontractors who expected projects to be awarded to family members. Appreciable results occur only by conducting strict oversight and withholding new funds until clearly-defined milestones are met. The medical operators’ ability to learn this system of business and knowing how to limit overpayment for services is key to mission success. Though different than a western business model, this system is not inherently right or wrong but just how business is normally conducted in Afghanistan. Although SOF operators pride themselves on cultural awareness and adaptation, sometimes it takes more than sharing a cup of tea to make you culturally aware.

Medical care provided to the local populace is the most cost effective method to establish rapport, and gain trust. Utilization of CERP funds was key to supporting the medical mission. These funds allowed the medical team to perform the MEDCAPs and begin the process of rebuilding the medical infrastructure. The SOF operator must have the ability to fund viable medical projects (such as the development of SOF Medical Operation Fund) which should be stressed and supported as a command emphasis.

SOF medical assets are most effective when deployed far forward where their unique training combines the roles of war fighter, health care provider, and nation builder. While we noted a tendency to retain SOF medical assets in the rear, co-located with conventional medical assets such as CSHs and FSTs, a bal-

ance between conservative asset management and risk of forward deploying SOF medical assets must be achieved to provide the positive impact SOF medical assets can provide and the opportunity to enhance their training and experiences.

One challenge of pursuing such broad-based medical operations is finding enough qualified medical operators to conduct the various missions. SOF medics are in short supply and prolonged operations in OIF and OEF have created multiple demands on the medical talent pool. Ground commanders who already feel they and their units are heavily tasked may be reluctant to offer full support to such a demanding task as operating a UW clinic. The SOF medic must always keep in mind that the base medical needs are the primary mission and that these needs must be met during the operation of the clinic and other “outside the wire” engagements. Supplemented by medical providers from other units and well-trained, organic junior medics and relying on medical expertise recruited from the local population, the team maintained medical readiness and capabilities of the base at a high level. It is incumbent on the medical personnel to both sell the concept to the command and work diligently to ensure the success of the medical mission. Initial concerns about the ability of the team to staff the clinic proved to be unfounded. The successful reputation of the “Maui Clinic” was well known before the arrival of the Group and it attracted a variety of health care providers. Many providers even voluntarily extended their tours in order to participate in this endeavor.

The SOF medical caregiver can be a vital, effective, and responsive method for supporting ongoing or rapidly changing tactical operational objectives. Additional training in SOF specific medical intelligence would enhance this role even further.



Children’s sick call in lower Clinic.



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# Antibiotic Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents

Clinton K. Murray, MD; Duane R. Hospenthal, MD; John B. Holcomb, MD

## ABSTRACT

Administration of antibiotics at the time of injury is recommended during combat operations to reduce the risk of subsequent infection. Previous recommendations have included oral gatifloxacin unless the patient was unconscious, in shock, or had received a penetrating abdominal injury, then intravenous (IV) or intramuscular (IM) cefotetan was recommended in these exceptions. Cefotetan and the previously recommended agent, cefoxitin, are either not being produced or in short supply, necessitating a reevaluation of the tactical IV/IM antimicrobial agent of choice. Although cefotetan is still recommended, ertapenem is a reasonable alternative meeting many of the requirements of an ideal point of injury antibiotic to be used in tactical combat casualty care.

## OBJECTIVES

1. Describe the pathogens colonizing battlefield injuries.
2. Explain the role antimicrobials play in management of battlefield injuries
3. List the ideal agents used in a tactical combat situation

**Financial Disclosure:** COL John B. Holcomb and MAJ Clinton K. Murray have indicated that, within the past two years, they have had no significant financial relationship with a commercial entity whose products/services are related to the subject matter of the topic they will be addressing or a commercial supporter of this educational activity.

LTC Duane R. Hospenthal has indicated that his presentations will include discussion of commercial products or services and within the last two years, he has had a significant financial relationship with a commercial entity whose products/services are related to the subject matter of the topic he will be addressing or a commercial supporter of this educational activity. (Merck- Grant for research of a drug not discussed in this article)

## INTRODUCTION

Infection is a complication of battlefield injuries that can lead to significant morbidity and mortality. Over 12,000 military personnel have been injured while serving in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).<sup>1</sup> Many of the casualties have required prolonged antimicrobial therapy for wound infections. Administration of antibiotics at the point of injury has been previously proposed based upon the potential

ability to reduce the risk of infection.<sup>2-4</sup> Recently, gatifloxacin was recommended by Butler and O'Connor for all wounded except those who could not take oral antibiotics due to unconsciousness, and those with penetrating abdominal injury or shock.<sup>2</sup> The alternate recommendation for these latter subjects was cefotetan. Although these recommendations are still valid, cefotetan production has been temporarily stopped and cefoxitin, a previously recommended alternative agent, is in short supply due to demand and manufac-

turing delays.<sup>5</sup> This has required a reevaluation of the recommended antimicrobial agent to be used in those patients who are unable to tolerate oral antibiotics (unconsciousness, penetrating abdominal injury, or shock).

## BACKGROUND

The use of body armor and rapid evacuation has allowed a larger percentage of war trauma casualties to survive until they reach medical care. A greater emphasis is now required on avoiding complications of severe trauma, including infections. Numerous factors influence the development of wound infections in a combat theater, including the type and severity of wounds, the presence of embedded foreign bodies or fragments, the clothing of the Soldiers, combat environment, evacuation time, wound debridement, immediate wound care, definitive surgical care, rehabilitative care, prior antimicrobial pressure, and the presence of nosocomial pathogens at treatment sites. The appropriate management of traumatic injuries and subsequent infection is influenced by the mechanism and type of injury; low-velocity missiles, high-velocity missiles, mines, mortars, and improvised explosive devices (IEDs) each result in characteristic patterns of injury. Some systems, such as mines and IEDs, can increase the risk of infection due to contamination of wounds from ground material or other matter placed in the devices (e.g., animal carcasses, used syringes, or fecal material). Although it has been argued that the heat generated from firing high-velocity weapons sterilizes bullets, this has proven not to be the case.<sup>6</sup>

The development of infection in a wound has always influenced the morbidity and mortality associated with trauma. However, the importance of infection in wounds was not fully appreciated until the introduction of bacterial culture methods and antimicrobial agents.<sup>7</sup> The specific bacterial flora found in wounds has changed over time. *Clostridium* species were recognized as a primary cause of wound complications prior to the implementation of adequate wound debridement. *Streptococcus* species were subsequently noted as common causes of wound infection until the introduction of penicillin. With widespread empiric use of penicillin, *Staphylococcus* species became the predominate microorganisms identified. Broader spectrum antimicrobials have been increasingly used to treat battlefield wounds after reaching medical care and now wounds have gram positive and potentially multi-drug resistant gram negative bacteria.<sup>8</sup> A 4% incidence of wound

infection was noted in the Vietnam war despite 80% of wounds undergoing debridement/irrigation and 70% receiving antibiotics.<sup>9</sup> Vietnam casualties who underwent amputation upon return to the U.S. had predominately *Pseudomonas aeruginosa* (47%) and *Staphylococcus aureus* (20%) isolated from wound cultures.<sup>8</sup> During the Arab-Israeli conflict in 1973 there was a 22% incidence of wound infection with cultures again revealing predominately *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Similar bacterial pathogens were noted in the Yom Kippur war and in Somalia during Operation Restore Hope.<sup>10,11</sup> During the Yugoslavian civil war (1993-1995), of the 63 casualties managed at a U.S. field hospital with musculoskeletal injuries, two of the four that developed infection were infected with *Pseudomonas aeruginosa*.<sup>12</sup> The rate of infection among penetrating brain injuries has been reported as high as 59% during the preantibiotic era of World War I to 4 to 11% with the current use of broad-spectrum prophylactic antibiotics.<sup>13</sup> The predominate bacteria in these infections are *Staphylococcus* species and gram-negative bacteria including *Acinetobacter*, *Klebsiella*, and *Enterobacter* species, and *Escherichia coli*. Injuries at high risk for infection included penetrating abdominal trauma, greater than 25% body surface burns, and femur fractures.<sup>10</sup> During Operation Iraqi Freedom, *Acinetobacter* species have complicated traumatic wounds in U.S. casualties upon return to U.S. medical facilities.<sup>14</sup> Although community acquired methicillin resistant *Staphylococcus aureus* (MRSA) is becoming a worldwide problem, its role as a pathogen in battlefield injuries has not been identified among casualties from Operation Iraqi Freedom or Operation Enduring Freedom.

The data linking organisms that colonize wounds at the time of injury to those that will likely cause acute infection is predominately limited to aerobic cultures obtained at the time of later infection, rather than at the time of injury. The only published study adequately addressing acute wound colonization is that of Tong in which he described the bacteria cultured from 63 wounds of 30 injured U.S. Marines in Vietnam.<sup>15</sup> Near the time of injury there was approximately an even mixture of gram positive and gram negative bacteria including *Staphylococcus epidermidis*, *Bacillus subtilis*, *Mimeae-Herellea-Bacterium-Alcaligenes* (organism potentially known as *Acinetobacter* today, although this was not found in any other study of that war), and *Enterobacter* group. Upon reevaluation of those patients five days after surgical therapy and implementation of antimicro-



bials, 84% of wounds grew gram negative bacteria. *Staphylococcus epidermidis* was replaced by *Pseudomonas aeruginosa* as the most frequently isolated organism. During OIF, 49 casualties with 61 wounds underwent wound cultures near the time of injury revealing a predominance of gram positive bacteria but no resistant gram negative bacteria such as *P. aeruginosa* or *Acinetobacter baumannii* (Murray et al, submitted for publication).

Data have been generated in animal models addressing the timing of development of wound infection after trauma. In one animal model of fragmentation injury, data suggested that more than three days were required for clinical and microbiological evidence of infection to develop.<sup>16</sup> In another study, antibiotics initiated within one hour of direct bacterial inoculation of wounded animals prevented infection for three days, but therapy delayed for six hours was ineffective.<sup>7</sup> Antibacterial activity at one hour could be overcome with increasing inoculum concentration. It appears that early use of antibiotics can prevent infection but if the bacterial inoculum is high enough then the timing or spectrum of activity of antibiotics is not as useful as wound irrigation and debridement.

#### APPROACH TO PREVENTION OF WOUND INFECTIONS

Trauma management currently emphasizes hemorrhage control, resuscitation, post-confirmation of tetanus prophylaxis, debridement, copious irrigation, and the use of appropriate antibiotics. This approach is based upon historical data dating back to World War II. The ability of antibiotics to alter battlefield wound infections was first shown when prophylactic penicillin prevented streptococcal wound infections. Penicillin use was replaced by more broad spectrum antibiotics with penicillin overlapping coverage. Since then, prophylactic antibiotics are considered common practice but are not founded on evidence-based medicine and prospective trials are unlikely to occur.<sup>2</sup> Tactical situations, especially combat, may hinder field medical personnel from adequately removing contaminating material from wounds by means of copious irrigation and debridement. Intravenous administration of antimicrobials is traditionally preferred to intramuscular or oral administration, given assuredness of administration, and time to (and higher level of) peak serum drug concentration. However, tactical combat situations and the notorious difficulty in keeping IVs in place often dictate the need for oral or intramuscular administration.

Ideally, the goal of prophylactic antibiotic therapy is the total avoidance of wound infection. Studies have shown that antibiotics given prior to surgical penetration of skin or other anatomical structures can prevent infection.<sup>17</sup> In one study of prolonged, general prophylaxis against skin and soft tissue infections among military trainees, single dose or weekly azithromycin was not successful.<sup>18</sup> Such continuous exposure to antibiotics has serious potential complications and guessing if and when injuries will occur is nearly impossible. Therefore, pre-trauma antimicrobial prophylaxis cannot be recommended for units with low rates of injury. One could possibly argue the role of prophylactic antibiotic therapy in urban operations when the injury rate is exceedingly high and the time of exposure is limited in duration and frequency. Defining the criteria to use in this setting and weighing the risk to benefit ratio of antibiotic exposure is challenging.

Factors important in the selection of antimicrobial agents for the tactical combat casualty may differ from those in civilian trauma care. Simplicity of use, including ease of transport and storage, reconstitution, and administration, safety, duration of activity, spectrum of activity, and cost all impact drug selection (Table 1). Spectrum of activity greatly impacts this antimicrobial choice since one of the main criteria for use of IV/IM administration is penetrating abdominal battlefield injuries. Thus, therapy must cover aerobic gram positive bacteria, aerobic gram negative bacteria and anaerobic bacteria including *Bacteroides fragilis* (one of the most common and resistant pathogens in the lower gastrointestinal tract). Coverage of resistant *P. aeruginosa* or *A. baumannii* is not necessary as these bacteria are not likely to be present in acute wounds. The choice of antibiotics should reflect the level of care provided in a combat zone. For point of injury and medical care without surgical capabilities, the goal of therapy is stabilization and rapid evacuation. For levels of care with surgical and holding capabilities, the goal is adequate surgical debridement. Although the type of injuries occurring at level I to III care are identical, many of the constraints placed on antibiotic choices at point of injury and level I care are not present in these other areas of a combat zone. For example, infusion time, infusion equipment, personnel, and transportation resources are more robust at level III care allowing the use of different agents that may require more frequent infusion intervals or more time.

Table 1. Characterization of parenteral antimicrobial agents for point of injury tactical combat casualty care.

Antimicrobial agent	Dose	IV/IM	Dosing Interval	Appropriate aerobic gram positive, aerobic gram negative, and anaerobic activity	Adverse Event	Mixture- IV (IM)	IV Infusion time (min)	Stability (temperature)**	\$/dose
Cefotetan <sup>^</sup>	2gm	Both	12 hours	Yes (increasing reports of <i>Bacteroides fragilis</i> resistance)	Minimal	1gm in 10ml (2gm in 3ml)	3-5	<72 °F	23.60
Cefoxitin <sup>^</sup>	1-2gm	Both	8 hours	Yes	Minimal	1gm in 10ml (1gm in 2ml water)	3-5	36-77 °F (appears stable to 122 °F)	11.98
Ertapenem <sup>^</sup>	1gm	Both	24 hours	Yes	Minimal	1gm in 50ml (1gm in 3.2ml 1% lidocaine)	30	<77 °F	28.30
Fluoroquinolone (Gatifloxacin)***	400mg	IV only	24 hours	No (minimal <i>B. fragilis</i> activity)	Minimal	10mg/ml in 40ml (Not available)	60	59-86 °F	12.15
Ceftriaxone <sup>^</sup>	1-2gm	Both	24 hours	No (minimal <i>B. fragilis</i> activity)	Minimal	1gm in 10ml (1gm in 3.6ml diluent)	30	<77 °F	16.51
Ampicillin/sulbactam <sup>^</sup>	3gm	Both	6 hours	Yes	Minimal	3gm in 50ml (3gm in 6.4ml)	15-30	<86°F	4.30

<sup>^</sup>Avoid in a casualty with a severe beta-lactam/penicillin allergy (i.e., anaphylaxis, IgE mediated response) due to potential cross-reaction IV - intravenous, IM - intramuscular

\*\* Extremes not evaluated for most antimicrobials

\*\*\* Gatifloxacin was selected as it is also the currently recommended oral agent. Moxifloxacin and levofloxacin have similar characterizations as described for gatifloxacin except levofloxacin has slightly greater gram-negative activity but less anaerobic activity.

Table 2. Matrix system for determining ideal point of injury tactical combat casualty care antibiotics

Weighted Items	Score			
	1	2	3	4
\$/day (1)	≤5	>5 ≤ 10	>10 ≤ 25	>25
Mixture (1)	Vial, ≤50cc reconstitute	Vial, >50cc reconstitute	Premix <50cc	Premix ≥50cc
Infusion time (2)	≤5 min	>5 ≤ 30 min	>30 ≤ 60 min	>60 min
Stability (2)	Extremes	Not tested	Limited	
Adverse events (2)	Minor, small %	Minor, large %	Major, small %	Major, small %
Dosing (3)	QD	BID	TID	QID
IV/IM (3)	Both	IV only	IM only	
Coverage (4)	Appropriate	Inadequate	Excessive	None

## MATRIX APPROACH TO SELECTION OF ANTIMICROBIAL AGENTS

Although cefotetan is an excellent point of injury antibiotic, other alternatives need to be provided given the current state of antimicrobial availability. The possible alternative agents are extensive (Table 1); however, the pros and cons of the various agents greatly influence the final determination. Agents such as piperacillin/tazobactam, imipenem/cilastatin, meropenem, and cefepime are potential candidates; however, they are not reasonable alternatives due to many of the restrictions imposed on a tactical combat environment and excessively broad bacterial coverage. In an attempt to develop a more rigorous approach to selection of antibiotics, we recently developed a matrix with weighted measures and a scoring system (Table 2). Parameters deemed important for point of injury antibiotics are weighted by a self-determined numerical value and as such can be modified as needed. For example, cost may not be considered an important issue and is given a weighted score of one. On the other hand, doses per day may be considered more important and given a weight of three. Each weighted measure also meets criteria as an ideal agent being scored from one as an ideal agent to four meeting minimal criteria as an ideal agent. By totaling the product of the weight and the score of individual criteria, each antimicrobial is given a numerical value. Comparison between agents can be made with the agent receiving the lowest score representing the ideal agent. Based upon the matrix system, ertapenem score is 25, cefotetan score is 26, ceftriaxone is 26, cefoxitin is 26, gatifloxacin is 31, and ampicillin/sulbactam is 33.

Ertapenem meets most of the criteria we propose as necessary to be an adequate point of injury tactical combat antibiotic. Ceftriaxone appears to be a reasonable alternative but its inadequate coverage would require the addition of a second agent for an intra-abdominal injury greatly raising the matrix score. Fluoroquinolones are also a possible alternative but they lack an IM formulation and their intra-abdominal coverage is inadequate. This contradicts many of the goals of an ideal single IV/IM agent for point of injury tactical combat casualty care.

Ertapenem is a once daily carbapenem which can be administered intramuscular or intravenously with excellent aerobic gram positive, anaerobic, and aerobic gram negative coverage excluding *Pseudomonas aeruginosa* and *Acinetobacter MRSA* species. One area of potential concern is that the use

of ertapenem will induce the development of imipenem/cilastatin or meropenem resistance in *P. aeruginosa* and *Acinetobacter*. In vitro data appears to indicate that this would require supraphysiologic doses.<sup>19</sup> The use of this agent will be typically limited to one dose as antibiotics are used as adjuvants to surgical debridement/irrigation and not required for prolonged periods. Once a casualty has reached surgical care, antimicrobials should change reflecting a new matrix system more specific for that level of care where for example weight, infusion time, and intervals may not factor as significantly in the score while other factors such as development of resistance or cost may have a greater influence on the matrix score. In addition, most antimicrobials are recommended for limited periods of time after definitive therapy (five days for neurosurgical cases and oral mucosal penetrating injuries, 72 hours for orthopedic injuries, and 24 hours for abdominal injuries with penetration hollow viscous injuries).<sup>20-23</sup> If evacuation is delayed, therapy should continue until definitive surgery is performed. This highlights the point that antibiotics should not be used gratuitously unless clinically indicated due to concern that resistance could develop and impact further utility of the agent. Finally, allergic reactions with ertapenem have not been described; however as is the case for cephalosporins, imipenem, and meropenem, if someone has a severe penicillin allergy defined as anaphylaxis (IgE mediated reaction) ertapenem should be avoided. Alternatives for the severely penicillin allergic patient include IV fluoroquinolones specifically gatifloxacin or moxifloxacin because of their slightly broader anaerobic activity (although its *B. fragilis* activity is inadequate and it does not come in an IM formulation) or IV fluoroquinolone and metronidazole (1 gram IV twice a day) for enhanced anaerobic coverage. Medical officers in each deploying unit should identify Soldiers at risk of this reaction and plan accordingly

## CONCLUSION

Management of battlefield injuries includes tetanus prophylaxis, debridement, irrigation, and antimicrobial therapy. Gatifloxacin (400mg daily) has been identified as the oral agent of choice. In the case of shock, unconsciousness, or penetrating abdominal injury, cefotetan (2 grams IV push over 3-5 minutes or IM every 12 hours) is the agent of choice but given the lack of availability, ertapenem (1 gram IV infusion over 30 minutes or IM every 24 hours) is the recommended alternative.

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The following five crossword puzzles are for continuing education. Puzzle clues are located on the reverse side of each crossword.

Please make sure if you are a physician, PA, or nurse, you send in the Uniformed Services University of the Health Sciences (USUHS) Evaluation Form on pages 73-74 with your puzzle. If you are a Medic, Corpsmen, or PJ, please send in the SOCOM Evaluation Form on page 75 with your puzzle.

Enjoy and please let us know how you like this form of testing on the Readership Survey on page 77.



# CONTINUING MEDICAL EDUCATION TEST

## JSOM



### 1. South American Military Working Horses Positive for Equine Infectious Anemia Crossword Puzzle



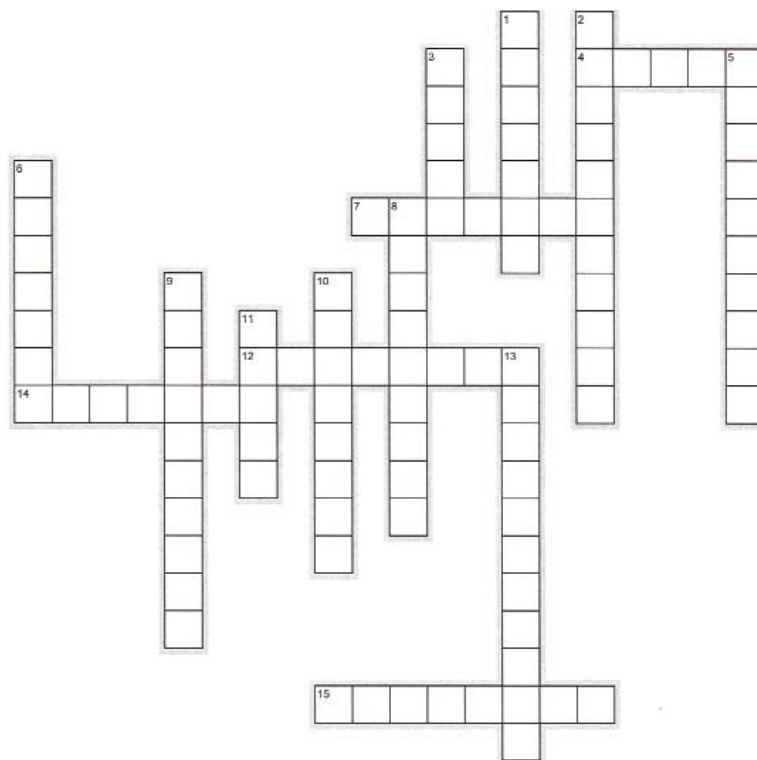
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**Editor's Note: All two word answers have a blank space between them in the crossword puzzle.**

USUHS is accredited by the ACCME to provide continuing medical education for physicians. USUHS designates article 1. *South American Military Working Horses Positive for Equine Infectious Anemia* and 2. *Prehospital Management of Head Injuries for the Combat Medic (combined)* for a maximum of **1.0** category 1 credit, and **1.3** CNE for nurses.

SOCOM Medics, Corpsmen, and PJs will be granted **1.3** CME for the two combined articles.



## South American Military Working Horses Positive for Equine Infectious Anemia Crossword Puzzle Questions

Created by Maj Michelle DuGuay with EclipseCrossword - [www.eclipsecrossword.com](http://www.eclipsecrossword.com)

### Across

4. Stables should not be built near \_\_\_\_\_, swamps, or low lands.
7. The three stages of EIA are acute, \_\_\_\_\_, and inapparent.
12. When an EIA diagnosis is confirmed, the infected horse should be segregated and \_\_\_\_\_ from the rest of the herd.
14. The horse with chronic EIA is often termed the classic “\_\_\_\_\_.”
15. EIA is primarily transmitted by blood-feeding tabanids and may be spread through other biting insects or contaminated vectors such as surgical instruments or \_\_\_\_\_.

### Down

1. The AGID, or \_\_\_\_\_ test, may be used to definitively diagnose EIA.
2. Repeated or continual pesticide \_\_\_\_\_ and screening open stables to prevent access of bloodfeeding flies are important measure to control the spread of EIA.
3. Equine infectious anemia (EIA) is also known as “Swamp \_\_\_\_\_.”
5. Acutely ill horses infected with EIA may be treated with general \_\_\_\_\_ and symptomatic care.
6. EIA is primarily transmitted by blood-feeding \_\_\_\_\_.
8. The 18D may make a presumptive diagnosis based on clinical findings, presence of biting insects and/or blood-feeding flies, and poor \_\_\_\_\_ practices.
9. Most of EIA-positive horses are \_\_\_\_\_ carriers and have substantially lower virus concentrations in their blood.
10. EIA clinical findings include \_\_\_\_\_, depression, weakness, progressive weight loss, intermittent fever, petechial hemorrhages on mucous membranes, and progressive anemia.
11. Equine infectious anemia (EIA) is a highly contagious and potentially fatal \_\_\_\_\_ disease of horses.
13. Equipment used on horses that may cause skin abrasions or absorb serous secretions should not be used or be \_\_\_\_\_ prior to use.

# CONTINUING MEDICAL EDUCATION TEST

## JSOM



## 2. Prehospital Management of Head Injuries for the Combat Medic Crossword Puzzle



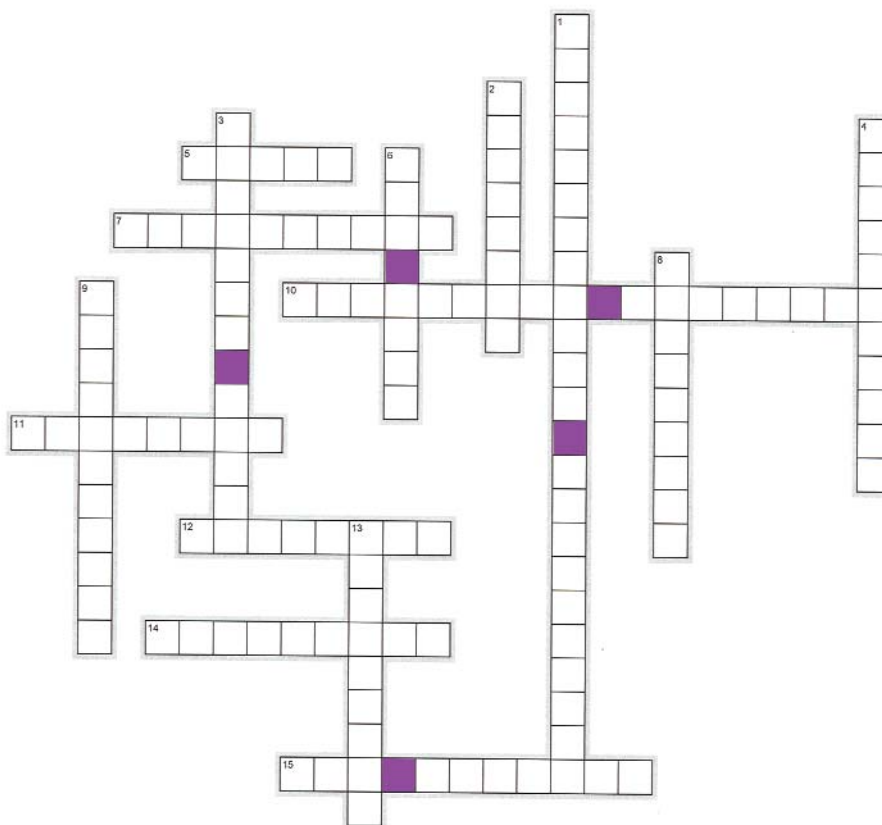
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**Editor's Note: All two word answers have a blank space between them in the crossword puzzle.**

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## Prehospital Management of Head Injuries for the Combat Medic Crossword Puzzle Questions

Created by Maj Michelle DuGuay with EclipseCrossword - [www.eclipsecrossword.com](http://www.eclipsecrossword.com)

### Across

5. The head is comprised of several layers: the scalp, skull, membranous connective tissue, and \_\_\_\_\_ tissue.
7. The use of mannitol in traumatic brain injury should be reserved as a last resort for patients with impending \_\_\_\_\_.
10. Cerebral \_\_\_\_\_ of 70mmHg has adverse outcome. (Two Words)
11. A \_\_\_\_\_ hematoma, hemorrhage between the dura mater and the brain tissue, is the most common severe head injury.
12. The use of \_\_\_\_\_ in traumatic brain injury should never be used due to its lack of effect and increased risk of infection.
14. The assessment tools that best correlate with patient outcome are \_\_\_\_\_ response and GCS score.
15. Per the 11 March 05 Joint Theater Trauma Registry, what is the incidence of Traumatic Brain injury in OIF/OEF? (Two Words)

### Down

1. It classically presents with a patient complaining of the worst headaches of their life. (Two Words)
2. A reasonable goal for the patient with TBI is resuscitation to a \_\_\_\_\_ blood pressure of at least 90 mm Hg.
3. Per the Monro-Kellie doctrine, intracranial pressure can only be reduced by reducing the amount of CSF and blood in the \_\_\_\_\_. (Two Words)
4. The most important factor contributing to secondary brain injury is? \_\_\_\_\_.
6. A single episode of hypotension increases mortality in TBI patients by \_\_\_\_\_. (Two Words)
8. Cerebral perfusion pressure (CPP) is an important factor in the outcome of \_\_\_\_\_ brain injury.
9. The use of \_\_\_\_\_ in closed traumatic brain injury should never be used.
13. The annual economic burden in the U.S. is approximately \$3 billion in \_\_\_\_\_ costs of initial hospitalizations.

# CONTINUING MEDICAL EDUCATION TEST

## JSOM



### 3. Patient Care: Care of the Muslim Patient Crossword Puzzle

**Please be sure to return the completed puzzle as well as the appropriate Continuing Education Evaluation Forms**

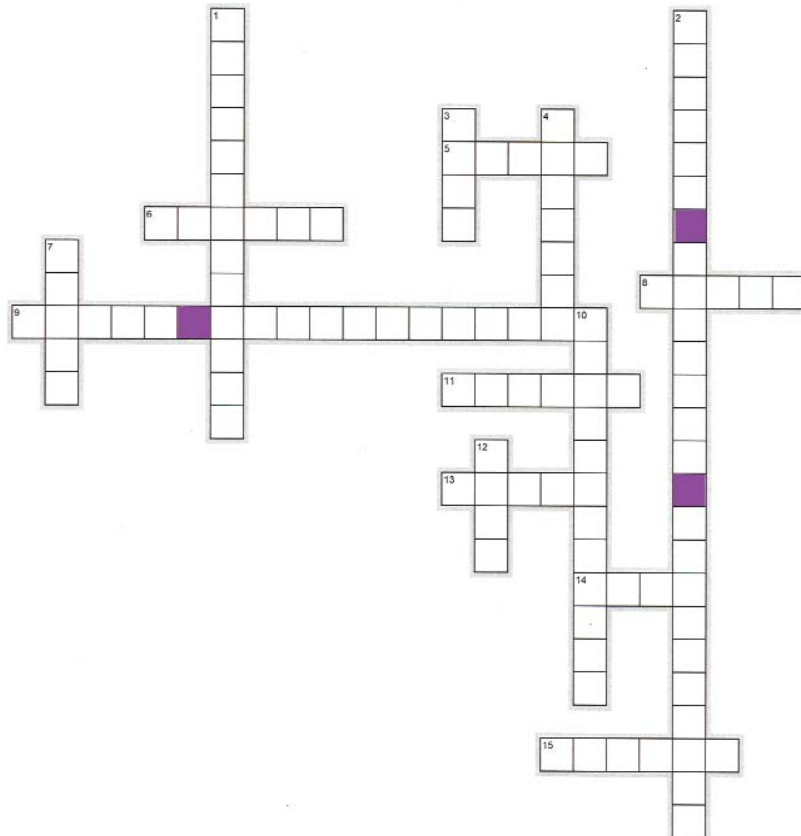


**Editor's Note: All multiple word answers have a blank space between them in the crossword puzzle.**



USUHS is accredited by the ACCME to provide continuing medical education for physicians. USUHS designates article Article 3. *Patient Care: Care of the Muslim Patient*; 4. *Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report*; and 5. *Antibiotics Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents (combined)* for a maximum of **1.75** category 1 credit and **2** CNE for nurses.

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## Patient Care: Care of the Muslim Patient

### Crossword Puzzle Questions

Created by Maj Michelle DuGuay with EclipseCrossword - [www.eclipsecrossword.com](http://www.eclipsecrossword.com)

#### Across

5. \_\_\_\_\_ is the Muslim name for God (It is a word used by pre-Islamic peoples in the Middle East, and is still used by Christian Arabs today.)
6. The holy day for Muslims is \_\_\_\_\_ when a patient may receive a number of hospital visitors above that normally expected.
8. For a patient who has just died, the face and right shoulder of the deceased should be turned in the direction of \_\_\_\_\_.
9. Muslims accept \_\_\_\_\_ and transplants of various human organs. (Two Words)
11. A \_\_\_\_\_ is a person who submits to the will of Allah.
13. It is preferred that the \_\_\_\_\_ hand be used for feeding or administering medications.
14. The \_\_\_\_\_ hand is considered unclean.
15. The Muslim place of worship is the \_\_\_\_\_ (mosque).

#### Down

1. The key to providing culturally sensitive care is good \_\_\_\_\_.
2. The practice of \_\_\_\_\_ by some Muslims from African countries, Asia, and the Middle East is not supported by the Islamic faith. (Three Words)
3. The great pilgrimage to the Kaaba in Mecca which is something that every Muslim must try to do at least once in life.
4. The month in which the Qur'an was revealed to Muhammad, and Muslims dedicate to fasting and spiritual concerns.
7. \_\_\_\_\_ signifies food that can be consumed, and which has been prepared according to Islamic law.
10. A holistic approach to care recognizes that \_\_\_\_\_ and health are intertwined for most patients.
12. There are \_\_\_\_\_ obligatory daily prayers, which are fixed sets of standing, bowings, prostrations, and sittings in worship of Allah.

# CONTINUING MEDICAL EDUCATION TEST

## JSOM



### Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report Crossword Puzzle



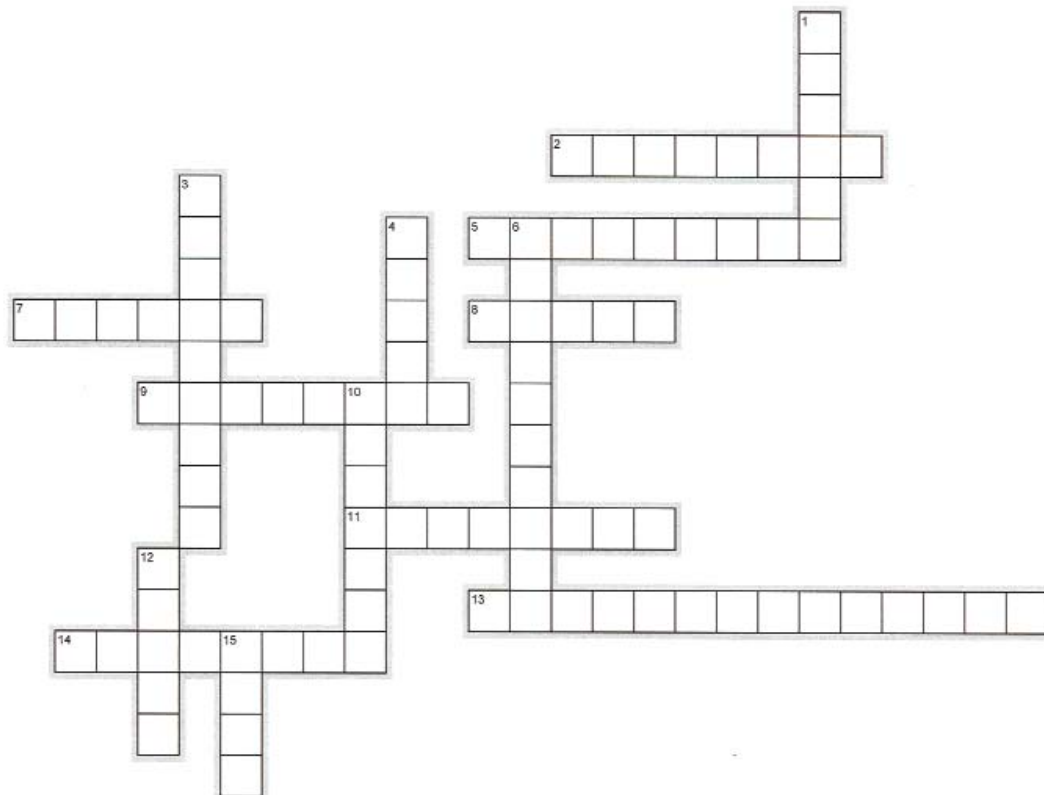
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# **Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report**

## **Crossword Puzzle Questions**

Created by Maj Michelle DuGuay with EclipseCrossword - [www.eclipsecrossword.com](http://www.eclipsecrossword.com)

### **Across**

2. Traumatic diaphragmatic \_\_\_\_\_ occur in 1 % to 6% of patients who sustain major blunt abdominal trauma.
5. Traumatic diaphragmatic hernias are \_\_\_\_\_ to diagnose.
7. When either liver or \_\_\_\_\_ injury is suspected, CT can reliably exclude injuries that require emergent operative intervention.
8. Traumatic ruptured diaphragmatic hernias affect predominately \_\_\_\_\_.
9. The vast majority of injuries sustained during an \_\_\_\_\_ operation are the result of blunt trauma.
11. Traumatic diaphragmatic ruptures occur in 3% to 8% of patients who survive major blunt \_\_\_\_\_ trauma.
13. Diagnostic peritoneal lavage can be used to exclude \_\_\_\_\_ in blunt abdominal trauma patients.
14. A \_\_\_\_\_ DPL is demonstrated by red blood cell count greater than 100,000ml after lavaging with 1L isotonic fluid.

### **Down**

1. Patients with diaphragmatic rupture presenting in the \_\_\_\_\_ phase frequently have adhesions between the herniated abdominal contents and intrathoracic organs; therefore, the rupture is best approached via a thoracotomy.
3. Initial symptoms of a traumatic diaphragmatic hernia include: \_\_\_\_\_ pain and shortness of breath.
4. CT has replaced the DPL as the evaluation tool of choice because it not only provides the ability to identify bleeding, but it can identify the source of bleeding as well as identify other \_\_\_\_\_ injuries.
6. The physical exam of the abdomen is notoriously \_\_\_\_\_ in blunt trauma and necessitates rigorous testing to rule out intraabdominal pathology.
10. The rate of missed diaphragmatic injury or \_\_\_\_\_ in trauma patients managed non-operatively is estimated to range between 12% to 60%.
12. Special attention should be given to the \_\_\_\_\_ lung fields and diaphragm as atelectasis or other minor lung changes may be all that is seen to suggest a diaphragmatic injury.
15. True or False: Blunt abdominal trauma is the leading cause of morbidity and mortality among trauma victims.

# CONTINUING MEDICAL EDUCATION TEST

## JSOM



### Antibiotics use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents Crossword Puzzle



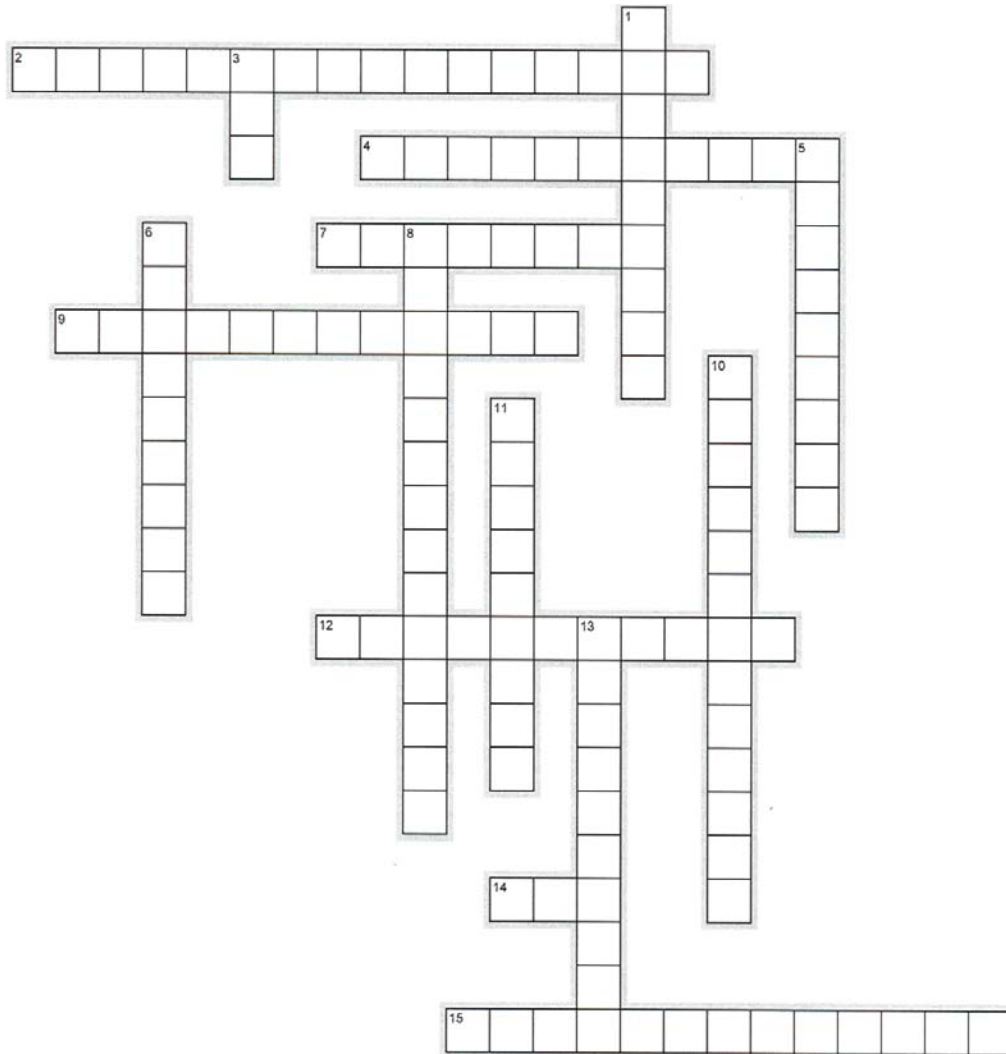
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# Antibiotics Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents

## Crossword Puzzle Questions

Created by Maj Michelle DuGuay with Eclipse Crossword - [www.eclipsecrossword.com](http://www.eclipsecrossword.com)

### Across

2. Alternatives for the severely penicillin allergic patient include IV \_\_\_\_\_, specifically gatifloxacin or moxifloxacin because of their slightly broader anaerobic activity for enhanced anaerobic coverage.
4. Continuous exposure to \_\_\_\_\_ has serious potential complications.
7. In an evaluation of wounds near the time of injury in Iraq, gram \_\_\_\_\_ bacteria were the most likely pathogens present.
9. \_\_\_\_\_ (400mg daily) has been identified as the oral agent of choice.
12. \_\_\_\_\_ species were recognized as a primary cause of wound complications prior to the implementation of adequate wound debridement.
14. Coverage for *P. aeruginosa* and *Acinetobacter baumannii* is \_\_\_\_\_ indicated at the time of injury.
15. \_\_\_\_\_ bacteria have been identified in casualties during OIF/OEF in those receiving medical care upon returning to CONUS facilities.

### Down

1. \_\_\_\_\_ is the agent of choice in the case of shock, unconsciousness, or penetrating abdominal injury.
3. In an animal model, antibacterial activity can be overcome if enough bacteria are inoculated into a wound even if the antibiotic is given within \_\_\_\_\_ hour of injury.
5. Although it has been argued that the heat generated from high-velocity weapons will \_\_\_\_\_ a bullet, this has proven not be the case.
6. An alternative agent in the case of shock, unconsciousness, or penetrating abdominal injury is \_\_\_\_\_.
8. With widespread empiric use of penicillin, \_\_\_\_\_ species became the predominate microorganisms identified.
10. Gatifloxacin can be administered orally and intravenously but not \_\_\_\_\_.
11. The goal of prophylactic antibiotic therapy is the avoidance of wound \_\_\_\_\_.
13. Trauma management emphasizes hemorrhage control, resuscitation, post confirmation of tetanus prophylaxis, debridement, appropriate antibiotics and \_\_\_\_\_.

**USUHS Continuing Education Evaluation Form**  
**Journal of Special Operations Medicine, Volume 5, Edition 3 / Summer 05**

**Date of original release:** 1 Sep 05

**Expiration Date:** 1 Sep 06

**Certificates:** Certificates will be mailed. Please allow up to 4 weeks for delivery.

**Physicians and Nurses:** Read the article designated for continuing education credit. Complete the Continuing Education Evaluation Exam and Post-test, providing correct responses to at least 80% of the questions and evaluation. Fax or mail the Post-test and the Continuing Education Evaluation Form to:

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United States Special Operations Command

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USUHS Continuing Education Evaluation Form  
Journal of Special Operations Medicine  
Volume 5, Edition 3 / Summer 05  
Date of Original Release 1 Sep 05

**Articles**

- 1. South American Military Working Horses Positive for Equine Infectious Anemia-- Page 12**
- 2. Prehospital Management of Head Injuries for the Combat Medic-- Page 27**
- 3. Patient Care: Care of the Muslim Patient--Page 39**
- 4. Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report--Page 43**
- 5. Antibiotics Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents--Page 56**

3- Agree    1- Disagree

**Educational Value:**

I learned something new that is important.  
I verified some important information.  
I plan to discuss this information with colleagues.  
I plan to seek more information on this topic.

3   2   1

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— — —  
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3   2   1

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— — —

**Readability Feedback:**

I understood what the authors were trying to say.  
Overall, the presentation of the article enhanced my ability to read and understand it.

— — —  
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**Were the educational objectives of the article(s) met?**

YES \_\_\_ NO \_\_\_

YES \_\_\_ NO \_\_\_

If no, please explain: \_\_\_\_\_

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YES \_\_\_ NO \_\_\_

YES \_\_\_ NO \_\_\_

Comments: \_\_\_\_\_

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**Articles 1&2?**    \_\_\_ minutes

**Articles 3,4&5?**    \_\_\_ minutes

**What changes will you make in your practice as a result of reading the article(s)?**

\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_

I hereby certify that I have read the article(s) of the activity identified above and am eligible to claim credit.

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



## USSOCOM Enlisted Personnel CME

Journal of Special Operations Medicine  
Volume 5, Edition 3 / Summer 05

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Please notify JSOM if you need it sooner.



**Enlisted Medical Personnel:** After reading the CME designated articles, complete the Crossword Puzzles for continuing education hours and send them in with the Continuing Education Evaluation Form. Please make a copy of this Evaluation Form for each article submitted and circle corresponding article title below. Fax or mail them to:

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### CME Articles:

1. South American Military Working Horses Positive for Equine Infectious Anemia -- Page 12

2. Prehospital Management of Head Injuries for the Combat Medic-- Page 27

The educational crossword puzzle activities for articles 1 and 2 (combined), offers 1.3 contact hours.

3. Patient Care: Care of the Muslim Patient--Page 39

4. Traumatic Diaphragmatic Hernia in a Ranger on an Airfield Seizure Mission: A Case Report--Page 43

5. Antibiotics Use and Selection at the Point of Injury in Tactical Combat Casualty Care for Casualties with Penetrating Abdominal Injury, Shock, or Inability to Tolerate Oral Agents--Page 56

The educational crossword puzzle activities for articles 3, 4, and 5 (combined) offers 2 contact hours.

3- Agree 1- Disagree

### Educational Value:

I learned something new that is important.  
I verified some important information.  
I plan to discuss this information with colleagues.  
I plan to seek more information on this topic.

3 2 1

— — —  
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3 2 1

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— — —

### Readability Feedback:

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Overall, the presentation of the article enhanced my ability to read and understand it.

— — —  
— — —

— — —  
— — —

Were the educational objectives of the article(s) met?

YES \_\_\_ NO \_\_\_

YES \_\_\_ NO \_\_\_

If no, please  
explain: \_\_\_\_\_

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YES \_\_\_ NO \_\_\_

Comments: \_\_\_\_\_

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# JOURNAL OF SPECIAL OPERATIONS COMMAND READERSHIP SURVEY

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Name: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 Branch of Service: \_\_\_\_\_ Rank: \_\_\_\_\_ Years in Service: \_\_\_\_\_ Career Field: \_\_\_\_\_

(Please use the scale to rank the following statements)

Poor 1	Fair 2	Satisfactory 3	Good 4	Excellent 5
How do you rate the Journal of Special Operations Medicine (JSOM)?				
How do you rate the JSOM overall readability?				
How do you rate the layout of this journal?				
How do you rate the quality of the articles?				
How do you rate the variety of articles?				
How do you rate the usefulness in enhancing your SOF medical knowledge/awareness?				

How much of the issue do you usually read?

Cover-to-Cover	75%	50%	25%	Less
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What is your favorite section of the JSOM? (Circle one)

Component Surgeon Input	Education & Training	Research & Development		OPS
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There I was	Correspondence	SOMA Update		

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Features	Abstracts	Current Events		
Invited Commentary	Editorials	Expendent Medic		
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Med Quiz	Photo Gallery	Dedication		
There I was	Correspondence	SOMA Update		

What improvements would you make to the JSOM?

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# ABSTRACTS FROM CURRENT LITERATURE

## Hypothermia Reduces Microvascular Permeability and Reactive Oxygen Species Expression after Hemorrhagic Shock

Journal of Trauma-Injury Infection & Critical Care. 58(2):271-277, February 2005.

Childs, Ed W. MD; Udobi, Kahdi F. MD; Hunter, Felicia A.

### ABSTRACT:

**Background:** Hypothermia is a frequent manifestation after trauma-induced hemorrhagic shock. Clinical studies have suggested that hypothermia is an independent risk variable predisposing patients to an increase in morbidity. Thus, most of the current goal-directed resuscitation protocols are aimed at the establishment of euthermia. However, recent data suggest that hypothermia may provide protection by attenuating the inflammatory response after hemorrhagic shock. The purpose of this study was twofold: to examine the effects of mild to moderate hypothermia on barrier function after hemorrhagic shock, and to determine the role of reactive oxygen species (ROS) in this process.

**Methods:** After a control period, blood was withdrawn to reduce the mean arterial pressure to 40 mm Hg for 1 hour in urethane-anesthetized rats. Mesenteric postcapillary venules in a transilluminated segment of small intestine were examined to quantitate changes in permeability and ROS expression. Sprague-Dawley rats received an intravenous injection of fluorescein isothiocyanate (FITC)-albumin during the control period. The fluorescent light intensity emitted from the FITC-albumin was recorded with digital microscopy within the lumen of the microvasculature and compared with the intensity of light in the extravascular space. The images were downloaded to a computerized image analysis program that quantitates changes in light intensity. This change in light intensity represents albumin-FITC extravasation.

**Results:** Our results demonstrated a marked increase in albumin leakage after hemorrhagic shock that was significantly attenuated with mild (34[degrees]C) and moderate (30[degrees]C) hypothermia. In addition, hypothermia attenuated ROS expression after hemorrhagic shock.

**Conclusion:** These data suggest that hypothermia may protect barrier integrity after hemorrhagic shock by inhibition of oxygen radical expression.

## Intracranial Pressure Changes during Rapid Sequence Intubation: A Swine Model

Journal of Trauma-Injury Infection & Critical Care. 58(2):278-283, February 2005.

Bozeman, William P. MD; Idris, Ahamed H. MD

### ABSTRACT:

**Background:** Controversy and speculation exist regarding intracranial pressure (ICP) changes produced by various combinations of rapid sequence intubation (RSI) agents. In this pilot study, we sought to develop a swine model to investigate these changes in classic RSI.

**Methods:** Eight adult swine were instrumented with arterial and intracranial pressure monitors. Four different versions of rapid sequence intubation were then performed sequentially in each animal in a crossover trial design: regimen 1, thiopental; regimen 2, thiopental and succinylcholine; regimen 3, lidocaine, thiopental, and succinylcholine; and regimen 4, pancuronium, lidocaine, thiopental, and succinylcholine. ICP and hemodynamic parameters were recorded and compared. Trials were excluded from analysis if baseline ICP measurements were unstable or if intubation was difficult.

**Results:** Peak changes in ICP were noted at 2 to 3 minutes after administration of induction agents. Mean values for peak changes in ICP were as follows: regimen 1 (n = 5), 3.6 mm Hg (95% confidence interval [CI], 1.0-6.2 mm Hg); regimen 2 (n = 9), 13.6 mm Hg (95% CI, 9.6-17.6 mm Hg); regimen 3 (n = 2), 16.0 mm Hg (95% CI, -34.8-66.8 mm Hg); and regimen 4 (n = 3), 12.0 mm Hg (95% CI, -8.3-32.3 mm Hg).

**Conclusion:** The model is effective. It enables investigators to examine the aggregate ICP effects of combinations of RSI medications. RSI regimens with paralysis produced threefold increases in peak ICP change compared with the sedation-only regimen. Pretreatment agents did not affect ICP changes. Future investigations can examine other agents and add experimental manipulation of ICP to simulate head injury physiology. Additional parameters including cerebral metabolism and/or oxygenation may also be explored.

### Citation Classics in Trauma

Journal of Trauma-Injury Infection & Critical Care. 58(2):364-369, February 2005.

Ollerton, Joanne Emma MRCP, DipIMC RCSEd, RAMC; Sugrue, Michael MD, FRCS(I), FRACS

#### ABSTRACT:

**Background:** The evolution of trauma may be analyzed by review of articles most frequently cited by scientific articles worldwide. This study identified the "trauma classics" by reviewing the most-cited articles ever published in The Journal of Trauma.

**Methods:** The Science Citation Index of the Institute for Scientific Information was searched for the 50 most-cited articles in The Journal of Trauma.

**Results:** Of the 12,672 articles published since 1961, 80 were cited over 100 times and 17 over 200 times. The most-cited article was by Baker, a hallmark publication on injury scoring published in 1974. Feeding postinjury, bacterial translocation, and multiple organ failure were common themes. Overall, 32% involved gastrointestinal topics and 18% involved injury scoring, with institutions in the United States publishing 80% of the articles.

**Conclusion:** This study identified the trauma classics from the last 42 years of The Journal of Trauma. Citation analysis has recognized limitations but gives a fascinating insight into the evolution of trauma care.

### Opinions of Trauma Practitioners Regarding Prehospital Interventions for Critically Injured Patients

Journal of Trauma-Injury Infection & Critical Care. 58(3):509-517, March 2005.

Salomone, Jeffrey P. MD, FACS; Ustin, Jeffrey S. MD; McSwain, Norman E. Jr. MD, FACS; Feliciano, David V. MD, FACS

#### ABSTRACT:

**Background:** Significant controversy surrounds the prehospital management of trauma patients.

**Methods:** A questionnaire describing clinical scenarios was mailed to a random sample of 345 trauma practitioners.

**Results:** The 182 trauma practitioners (52.8%) who returned the surveys were predominantly general or trauma surgeons (83.5%) in academic or university practice (68.1%). For a patient with a severe traumatic brain injury, 84.5% of trauma practitioners recommended that emergency medical services personnel attempt intubation at least once when transport time was 20 to 40 minutes. For a patient with a gunshot wound to the epigastrium in decompensated shock, the majority of trauma practitioners believed that a relatively hypotensive state should be maintained, regardless of transport time. Trauma practitioners (52.2%) have recommended the use of the pneumatic antishock garment for transports of 20 to 40 minutes for patients with an unstable pelvic fracture and decompensated shock.

**Conclusions:** Most trauma practitioners believe that emergency medical services providers should attempt intubation for a patient with a severe traumatic brain injury, should treat decompensated shock in a patient with penetrating torso trauma but maintain the patient in a relatively hypotensive state, and should apply and inflate the pneumatic antishock garment for a suspected pelvic fracture accompanied by decompensated shock if the patient is 20 to 40 minutes from a trauma center. The recommendations of trauma practitioners regarding appropriate prehospital care are significantly influenced by the time required for transport to the trauma center.

## *Correspondence*

### *Letters to the Editor & Apologies to the Readers*

I accidentally found your Special Operations Journal of Medicine in the magazine rack at Norwalk Los Angeles County Library. I found this magazine to be very informative and practical. I am a medic in the Army Reserves and think this journal will be highly appreciated back at the 437th Med Co (GA) at March Air Reserve Base in Riverside, CA. How do I go about ordering this journal for my unit?

Thanks

I am a Sergeant, senior Medic of the Royal New Zealand Medical Corp. I am currently serving in Afghanistan where I have read an old Journal of Special Operations Medicine. I am thoroughly impressed by the layout, articles and content of the Journal. I would like to inquire whether the Journal is made available to medical units/individuals outside of the United States Forces? I have liaised with some of your SF Medics and our training/knowledge and Esprit De Corp is very similar. Please advise if I can submit to the Journal of Special Operations Medicine. Alternatively I would like to submit an article.

Kindest Regards

Sergeant

Senior Medic

Sorry for my delay but wanted to compliment you and the JSOM team on another great JSOM-Fall 2004. This journal has truly evolved into a great educational-training tool that can be utilized not only by our SOF family but throughout the entire joint, interagency, and multi-national arena. I continue to use the JSOM at the staff college as well as using it at Portsmouth NMC with other doctors and medical personnel.

Thank you for allowing me to stay on your editorial team.

Cheers

COL Bill Davis

**Editor's Note:** COL Davis is a faculty member with the joint and combined Warfighting School, Joint Forces Staff College. Colonel Davis was assigned as Director, Special Operations, Army War College, Carlisle, PA - Chief, Special Forces Branch, U.S. Army PERSCOM, Wash, DC

I would like to say that although I am a DOC and your CMEs are directed at 18Ds, I use the info routinely in my "locum tenens" practice in "austere" environments. We all need all the help we can get.

LTC, MD

You guys are doing an incredible job! Keep up the good work.

SSG-18D

Inclusion of some more science-based literature. Interesting case reports or new studies with direct operator application should be the primary goal of the SOCOM Docs to get these folks to publish in the JSOM.

CPT-MD

We want to see more articles on issues related to trauma procedures, true life, and/or lessons learned. Also, equipment used, true life and/or lessons learned.

GMSGT-8654



Develop more interaction among readers regarding medical experiences and lessons learned, especially medics currently deployed and deploying. I would like to see a discussion of which antibiotics to take to the field for the least weight (volume) and the widest coverage.

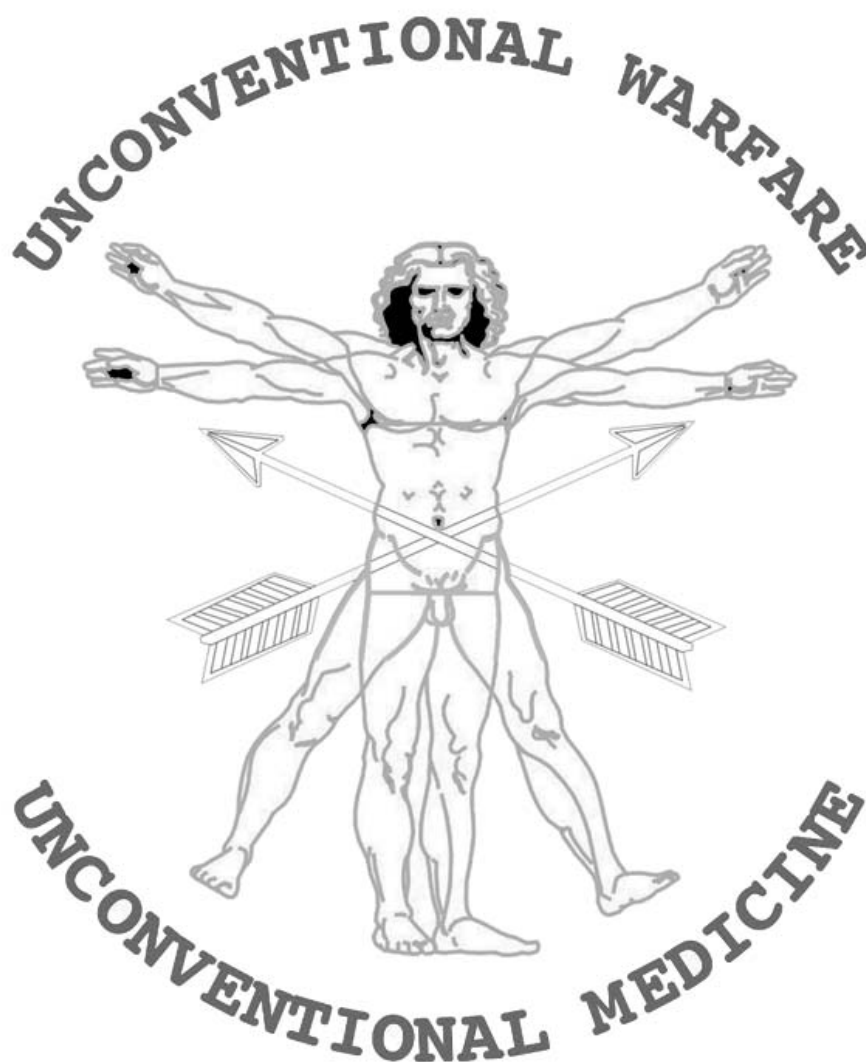
CPT-62A

Get it out to all SOF medics!

SFC-18D

A review of available courses, i.e. OEMS, CMC Ropes and Rescue, SOMA .... Finding out whether these courses are worth the money would be useful.

MSgt-PJ





## **Painless Minor Wound Care: Preventive Medicine in the Austere Environment**

Guy M. Clark, 18D  
Rick Hammesfahr, MD

**ABSTRACT.** Topical anesthetic agents are described to improve wound care by reducing pain, thus improving bedside manner and patient compliance in self-care of wounds. Improved wound care also saves time and resources by helping to curb infection. Cellophane wound dressings are presented anecdotally. Sugar and other ditch medicine techniques are also mentioned for providing alternative techniques to the SOF medical operator. Basic principles of care are only limited by the imagination of the SOF medic in the field. They are represented by the ability of the SOF medics to modify resources, improve patient care, and do no harm with whatever works.

Although not life threatening, infected minor wounds may be serious. They are a drain on limited medical resources while in the field, and can sideline the fighter as much as a serious wound. This short article may help the Special Operations Forces (SOF) medic keep wounds of unit members and those of auxiliary forces infection free. However, clinicians anywhere may find practical and useful information here.

Wound cleaning is focused on the physical removal of foreign material and associated microbes. Experience shows that difficulties with proper treatment can often be attributed to the obstacle of pain associated with physical removal of foreign matter. This is especially true when proper treatment requires that the patient return for multiple debridement sessions. Understandably, patients are often less committed to proper wound care and are less likely to return for therapy when the cleaning and debridement process is painful. The use of topical anesthetics is an obvious benefit to increase the likelihood of patient compliance with respect to proper wound treatment and infection control as contaminated wounds heal.

Consider that in the military, SOF medics are trained in, and most patients are familiar with, the controlled clinical environments found stateside. Simple wound cleaning procedures are easily performed in the CONUS clinic where help and supplies are plentiful. However, once in the field, this simple procedure becomes a fond memory for the SOF medic as the lack of adequate assistance, supplies, or a relatively clean (or sterile) environment becomes the harsh reality. The simple procedure is transformed into a delicate operation. Any advantage to streamlining recovery and avoiding infection, such as the use of topical anesthetics, ought to come into practice whenever possible.

Due to the limitations of an OCONUS setting and the natural tendency for fresh wounds to become inflamed and painful, patients may sustain a temporary increase in their inflammation and tenderness following the SOF medic's initial treatment of a contaminated wound. Trained medical personnel and some American servicemen may understand that this is normal and to be expected. However, many U.S. troops and the indigenous forces may not understand. As a result, the likelihood of the patient continuing with a self-treatment program, or returning for repeated debridement procedures, which result in repeated insult and further pain, is less likely.

Even though educated people often resist the pain of a good wound cleaning, a person's desire not to self-inflict pain is by no means limited to the people of developed countries. Patients of the less developed cultures, where SOF forces are often assigned, may be even less likely to take the necessary measures to provide for adequate self-administered care if pain results. Pain, perhaps acceptable in some cultures as the way of the body to release evil, may be tolerable to some degree. However, if pain results, how committed will the patient be to a program of repeated painful debridement, packing, and dressing changes? This question is especially valid if

there are language barriers that prevent the patient's understanding of germ theory and the necessity of the proper cleansing and debridement techniques.

Infection problems often occur with OCONUS deployed U.S. Soldiers as well as within the indigenous population, but for different reasons. Injuries and wounds that are relatively common and minor while in the U.S. (hang-nails, ingrown toenails, minor scrapes and scratches, abrasions, burns and even the vesicles of contact dermatitis), become much more serious when a U.S. serviceman is OCONUS.<sup>1</sup> When U.S. Soldiers are exposed to the common endemic germs of a foreign environment, their wounds are extremely susceptible to infection. Therefore, the care and time required for minor wounds to heal is invariably longer and more labor (and supply) intensive than for a similar wound that occurs at home.

An obvious answer to the problem of repeated painful wound debridement is the use of injectable local anesthesia. However, this can be expensive and cumbersome in terms of the supplies required. Topical anesthesia is a sensible alternative to treat the patient, clean the wound, and increase patient compliance with respect to wound care and maintenance.

#### **CASE EXAMPLE**

The importance of adding local anesthesia to aid bags became obvious when I assumed the care of a patient with a 40 square inch abrasion of the thigh. The original treating SOF medic was injecting the abraded area with lidocaine in a systematic pattern while providing the patient about four beers to sedate him for wound cleaning/scrub/dressing change. I assumed care after two days of this treatment.

On his first day under my care, the patient dutifully came to me for what was an unpleasant and stressful ritual. I squirted Betadine® Solution on the wound, blotted the Betadine®, gave the patient a piece of gauze with Hurricane® Anesthetic Gel on it, and told him to apply it to the wound. After observing his joyful reaction to wound desensitization, I gave him another piece of gauze with Betadine® Scrub and let him perform his own wound care, under my supervision. He was able to scrub the wound to bleeding granulation tissue without any difficulty or significant pain apparent.

After disinfecting with Betadine around the wound, I used a material and a method to dress the wound which has now become one of my normal dressing techniques. Tegaderm® plastic cellophane-type adhesive dressings are applied to the wound, and left in place for five days. (This dressing is recommended for an application limit of five days per dressing, but can be repeated as necessary.) After a week the wound was completely healed and only required superficial protection.

#### **CELLOPHANE DRESSINGS**

In the absence of a Tegaderm® dressing, I have successfully improvised an equally effective field dressing (i.e., cellophane) that functions in the same fashion. The cellophane dressing is applied in a stepwise fashion:

- ✓ After debriding, cleaning, and disinfecting the periphery of the wound by about two inches, place a cellophane type material to overlap the wound by about one inch.
- ✓ A gauze wrap or absorbent bandage (or a clean piece of cotton T-shirt) is applied to overlap the cellophane dressing.
- ✓ An Ace wrap or tape is then used to hold both the cellophane and overlying absorbent cotton material in place.
- ✓ The gauze or cotton cloth dressing, immediately against the cellophane type material, is changed every day or two as needed.

The cellophane type material allows serous fluid to drain. Fluids are wicked away from the wound by a clean absorbent dressing on the periphery of the cellophane. The formation of granulation tissue can be observed through the cellophane dressing and shrinkage of the wound becomes apparent on a daily basis.

Less fuss, less patient trauma, less clinic time, and fewer materials were required to treat the wound this way as opposed to the standard daily dressing changes. I estimate that the wound healed approximately 40% faster with the cellophane, as opposed to traditional methods. Tegaderm is one of several commercial products available. However, it is not essential to use this or any other commercially manufactured product of this type for wound care and healing.

## ADVANTAGES OF TOPICAL ANESTHESIA

I have had great success with wound cleaning and superficial debridement of lacerations, burns, and abrasions using Hurricane® gel and other topical anesthetic agents. Some of these products are only labeled for mucosal use. With this type of anesthetic, it is often unnecessary to inject local anesthesia, or to use potentially disabling injectable pain meds. In addition, it is possible to dispense some topical anesthesia for the patient to use outside of the clinic setting when the patient does his own wound care. Needless to say, the use of a topical agent in pediatric wound care is a winner for the SOF medic and the concerned parents! Other agents that I have used with equal success are - Oragel® and lidocaine gel. Hurricane® comes in a spray bottle which has obvious advantages.

Painless wound cleaning makes your job easier and allows you to do a better job. You can reduce patient distress initially and can help them manage their own wounds by giving them anesthetic gel and instruction in proper wound care techniques.

## MATERIALS REQUIRED AND PROCEDURE DETAILS

The recommended procedure for a thorough initial cleaning and debridement is:

- A) Set-up wound-wash and dress:
  - 1) Betadine® (povidone-iodine) solution
  - 2) Betadine® Scrub
  - 3) Topical anesthetic salve or gel
  - 4) Ten 4 x 4 gauze sponges
  - 5) Injectable anesthetic equipment prepared
  - 6) Wash basin
  - 7) Highest quality water
  - 8) Wound dressing material
- B) Liberally douse the wound with Betadine® solution; blot with gauze (Betadine® wipes or swab will do if no solution available).
- C) Place enough anesthetic gel on the wound to make a 1/8th inch layer over the entire wound. Allow the patient to massage this into the wound for 10 minutes. In the absence of Hurricane® Gel, any injectable lidocaine or benzocaine solution will be helpful. The injectable solutions may be applied topically by simply soaking a gauze sponge in the solution, and then placing the sponge on the wound. (Even anesthetic hemorrhoid cream may be used; however I have not used the cream for this procedure.)
- D) Wipe-off excess anesthetic and have the patient scrub the wound with gauze, Betadine® scrub and water over a wash basin for five minutes until loose material is removed. (Use any skin soap if no Betadine® Scrub is available).
- E) Inspect wound, use a brush, forceps, and scissors to remove any remaining foreign material, devitalized skin, or tissue.<sup>2</sup>
- F) If necessary, inject local anesthesia to help debride areas, dissect any tracks, or to expose all wound recesses.
- G) Irrigate with copious amounts of water, re-inspect, irrigate, and blot dry.
- H) Dress the wound. Dressing the wound may include salve, gauze, and tape or an Ace bandage, but consider a Tegaderm® cellophane type dressing.

## OTHER WOUND CARE TIPS - WHATEVER WORKS:

- ✓ **Antibiotics:** Antibiotic use works best when instructions for taking a daily dose are limited to no more than two doses per day, or ideally one dose daily. Also, be sure to explain to the patient that antibiotics work even after an infection appears to be healed; “hidden” germs are killed during the last days of an antibiotic regimen. For this reason, it is important to be sure to finish the antibiotics, even if the wound appears healed. Hopefully, during the last days of a course of therapy, this explanation will help to increase patient compliance.
- ✓ **Sugar:** Sugar and honey are used by traditional medical practices around the world. Panela is popular in Latin America. Sugar is loosely accepted by many knowledgeable physicians as a legitimate way to treat open wounds, especially when they are chronic. However, in the United States, this is rarely used and fails to replace conventional treatment due to potential legal complications. Skin ulcers and other difficult to heal



or chronic wounds may succumb to sugar, wrapped against the wound and replaced when the sugar mixtue has become saturated.<sup>3</sup>

- ✓ **Cellophane:** This is a great wound dressing for host nation (HN) personnel. It becomes especially effective when Betadine® and sugar are mixed to create a paste.<sup>4</sup> The paste is then packed into the wound, and covered with cellophane.
- ✓ **Local anesthetic kit:** Keep a 3cc syringe, 25ga needle, and three dental ampoules handy for light-fighter, short mission aid-bag-based wound cleanings, debridement, and closures where you don't want to carry a vial of lidocaine. This deep cleaning and debridement gear may enable you to keep a troop in the field. The ampoules provide a handy dose of local anesthesia when a topical anesthetic is inadequate for cleansing or if a few sutures are needed.
- ✓ **Wild water wound wash:** There are several techniques available to obtain clean water for wound lavage and irrigation.
  - ✓ Even while plenty of drinking water is available to wash wounds, place iodine tablets in your aid-bag for disinfecting wild, collected water. There is no substitute for copious amounts of well-strained, disinfected, wild water for lavage of wounds. Water prepared in this fashion is probably as good as boiled water. Four or more iodine tabs per quart will not harm the patient and will reduce bacteria while flushing the wound.
  - ✓ Add salt to any fresh water used for wound cleaning for added disinfection and isotonicity (two teaspoons per liter).<sup>5</sup>
  - ✓ Sufficient amounts of sterile water required to treat multiple patients are often in short supply. By adding sodium hypochlorite (bleach) in a 5% solution to local water, the resulting solution (Dakin's) could substitute for sterile irrigation fluid.<sup>6</sup>
- ✓ Maggots are cuddly and well founded in wound care technology.
- ✓ Garlic is an effective antiseptic topically when minced. An excess of garlic can be boiled and the oil applied to heal wounds free of infection.
- ✓ Hurricane® Gel:
  - ✓ Hurricane® Gel topical anesthetic, for oral or mucosal application. Comes as a gel or topical spray.

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SFC Guy M. Clark is an SF medic, with C Company/3rd Battalion/20th Special Forces Group (Airborne) since 1981. He currently serves on the USSOCOM Command Surgeon's CEB as the Army Special Operations Medical Sergeant, Primary 18-D, Operator. He has earned a Baccalaureate in Science with numerous additional studies of special interest in parasitology, tropical medicine, ethnobotany focused on urgent care, and preventive medical subjects. He has carried out medical missions in the combat theaters of Afghanistan, Colombia, and Bosnia and performed MEDCAP (medical civil action programs) activities for the U.S. military, U.S. Department of State, United Nations, non-governmental organizations, universities, and other independent medical assistance missions in eleven countries with over 50 deployments to South and Central America.



Rick Hammesfahr, MD, graduated from Colgate University in 1973 and the College of Medicine and Dentistry of New Jersey in 1977. He was Chief Resident in Orthopaedics at Emory University from 1980-1982. In addition to receiving numerous surgical awards, he has been on the speaking faculty of numerous medical and orthopaedic meetings, serving as the co-director of several courses on arthroscopy. His publications have focused on arthroscopy, calcaneal fractures, abductor paralysis, wound healing, running injuries, meniscal repair, septic knees, and sports medicine. He has written 2 book chapters, published 14 articles, and has presented over 45 lectures and talks on sports injuries. He has served as President of the Southern Orthopaedic Association. Currently, he is the Director of the Center for Orthopaedics and Sports Medicine and serves as the orthopaedic sports medicine specialist on the USSOCOM Curriculum and Evaluation Board.



## **After Action Thoughts Regarding 2005 APR 04 E Co Suspected Land Mine Incident**

1. As a platoon returned to its firm base in the AO, the first vehicle suddenly exploded and rotated counterclockwise 90 degrees from the original direction of travel. The explosion and rotation threw one Marine from the vehicle. The second vehicle halted approximately 30 meters back and the Corpsman proceeded to vehicle one on foot.

The A-driver (Pt #1) was ambulatory and responsive, but stunned and confused, without any obvious injuries. The gunner (Pt #2) was still in the vehicle caught in debris, screaming and with obvious injuries to all four extremities, especially the lower limbs. The driver (Pt #3) was also still in the vehicle and conscious but confused. Pt #1 and another Marine, under the direction of the Corpsman, removed him from the vehicle. The Corpsman noticed fuel leaking and the engine still running, but was unsuccessful in shutting down the vehicle.

The left rear seat passenger (Pt #4) was out of the vehicle screaming for the Corpsman, who quickly visually assessed Pt #4, reassuring him he would attend to him shortly. The Corpsman cut away some of Pt #2's clothing and moved him, with assistance from two Marines, to about seven meters from the vehicle. All four extremities were bleeding profusely. The distal lower extremities appeared to have unstable fractures and both upper extremities had multiple fragmentation wounds. Treatment at this time consisted of hemorrhage control with the placement of tourniquets (CAT). The Corpsman then moved to Pt #4 and assisted him in moving farther from the destroyed vehicle. His wounds consisted of active hemorrhage from the left lower extremity, which lost soft tissue between the knee and ankle, and partial amputation of the left 5th finger. A tourniquet (CAT) broke while being applied above the knee and the Corpsman quickly replaced it with a bungee cord, which slowed the bleeding.

The Corpsman then proceeded to a passenger who had been in the far back of the vehicle (Pt #5) and who already was a few meters away. He found active bleeding from the proximal right upper extremity. Cutting away clothes to expose the arm, the Corpsman found an open wound from the medial biceps up into the posterior axilla and with an apparently unstable humerus fracture. He placed a tourniquet (CAT) as proximal as possible to control the hemorrhage. The Corpsman then proceeded to where the right rear seat passenger (Pt #6) was thrown approximately 10 meters from the vehicle. He was in the prone position with body armor and helmet blown off, all four extremities essentially absent, and with massive damage to the torso, resulting in fatal injuries.

The Corpsman returned to Pt #5 and found the upper extremity wound still bleeding slowly. He moved the tourniquet a little higher and decreased but did not stop the bleeding. Next he applied a pressure dressing with rolled gauze (Kerlix) and elastic bandage to control the bleeding, then splinted the extremity with a SAM device. The Corpsman then administered intramuscular morphine and attached the auto injector to the blouse pocket.

The Corpsman returned to Pt #4, who was alert and responsive, but had slow bleeding from the lower extremity. He applied a second tourniquet (CAT) to the thigh distal to the first tourniquet and succeeded in controlling the slow bleeding. After reevaluating Pt #3, the Corpsman found a laceration in the right supraorbital region but no apparent injury to the orbit. The frightened patient calmed down after assurance by another Marine under the direction of the Corpsman. When the Corpsman reevaluated Pt #2, he found active bleeding from the right upper extremity from failure of the previously applied CAT due to a broken windlass. The Corpsman applied a bungee cord, which slowed the bleeding, and then applied a second CAT which stopped the bleeding.

Although the left upper extremity also was bleeding again, it resolved after tightening of the original CAT. The Corpsman administered intramuscular morphine and attached the auto injector to the blouse pocket. He reassured Pt #2 and left him with another Marine to provide care and comfort.

The Corpsman returned to patients #5 and #4 and administered transmucosal Fentanyl oral lollipops for pain control. Patient #2 received a Fentanyl lollipop for additional pain control as well. The Corpsman reassured patient #3 and directed Marines to place the remains of patient #6 into a body bag from vehicle 2. He then reassessed patient #5, whose pressure dressing and tourniquet seemed to have controlled the bleeding. Patients #1 through 6 were prepared for aeromedical evacuation.

**DISCUSSION:** A four-door, open-backed HMMV struck what was felt to have been an antitank mine. The six passengers in the vehicle suffered the following injuries: driver (Pt #3) supraorbital laceration; A-driver (Pt #1) none; left rear seat (Pt #4) massive LLE bleeding; right rear seat (Pt #6) fatal; gunner (Pt #2) unstable fractures bilateral LEs and hemorrhage from bilateral LEs and UE; rear passenger (Pt #5) proximal LUE fracture and hemorrhage. The Corpsman, essentially acting alone, successfully assessed, managed, and directed assistance for all six casualties. Unable to attend to all simultaneously, he used quick visual assessments and verbal reassurance (e.g., Pt #4 initially) while performing his tasks. Hemorrhage control was the focus of attention, as the injured were alert and responsive, suggesting no immediate airway or breathing compromise. He applied a total of seven tourniquets (CAT) to control profuse bleeding. Two of the windlass rods broke while being tightened (Pt #4 and #2). Further discussion with the Corpsman revealed they were an older version of the CAT, with the smooth plastic windlass, rather than the others with the five circumferential grooves in each end of the rod. Bungee cords utilized as field expedient tourniquets (Pt #2 and #4) functioned well as a temporizing measure. The Corpsman utilized intramuscular morphine and transmucosal Fentanyl, reporting an apparently more rapid response with the latter. Splint material was used to stabilize the apparent LUE fracture in Pt #5. Although the initial care report it mentioned no splints utilized for the care given to Pt #2, seems likely the Corpsman splinted the bilateral LEs since he mentioned the unstable fractures in the report. The report indicated the Marines acted calmly and professionally, demonstrating the benefit of the Tactical Combat Casualty Care training and review of immediate action drills.

**RECOMMENDATIONS:** Review the CATs in possession of the battalion and be aware that the non-grooved windlass may fail during application. Provide expedient windlass tourniquets (e.g., tubular nylon, plastic Gatorade rings, and wood dowels) pending arrival of supply of newer model CATs from manufacturer. While some personnel advocate utilizing bungee cords, field trials failed to suppress a distal pulse when applied to an uninjured extremity. When utilizing Fentanyl lollipops to provide rapid pain relief, attach the lollipop or mark the patient to assist in the downstream assessment/management at higher echelons of care. Continue to provide TCCC instruction to all unit personnel.

2. Since dedicated aeromedical assets were approximately 30 minutes away from arriving, a UH-1 gunship on station landed, made room, and evacuated Pts #2 and #4 as urgent surgical patients after receiving report of their pain management so far. Several minutes later two CH-46s landed and transported Pts #3 and #5 on the first helo and Pts #6 and #1 on the second.

**DISCUSSION:** The UH-1 served as a lift of opportunity and was willing to land and transport the first two urgent casualties. This opportune and pragmatic solution was appropriate since: 1) the patients had no immediate airway, respiratory, or circulatory compromise requiring medical care en route; 2) the flight to the level II surgical facility was relatively short.

**RECOMMENDATION:** Utilize available lift if the clinical and tactical situation supports that decision. Realize this may include ground assets, as well as non-dedicated air assets.



## Upcoming Events

The USSOCOM Surgeon's Office does not endorse any of the below listed private contractors who provide medical training nor does the USSOCOM Surgeon's Office vouch for the competence of the instructors providing the training. This listing of education opportunities is simply to help our readers in the event some would like to further their continuing medical education.

### **Tactical EMS 2005 Conference and Exposition**

**31 August - 3 September 2005**

**Sheraton - San Diego, California**

**<http://www.tems.org/training/information.html>**

Given the outstanding contributions made by military medical personnel since September 11th, the theme for the 5th Annual "Medic Up" Competition and "Tactical EMS 2005 Conference and Exposition" is: "Thanking Military Medicine for its Service and Sacrifice."

By bringing together some of the world's most experienced Special Weapons and Tactics (SWAT) officers, military Special Operations Forces (SOF) personnel and tactical medical providers, these timely, informative, and exciting events will offer attendees educational and training opportunities that will position them on the cutting edge of tactical medicine and enhance their ability to bring good medicine to bad places.

To help the International Tactical EMS Association (ITEMS) accomplish this mission, the Special Operations Medical Association (SOMA), National Tactical Officers Association (NTOA), and Casualty Care Research Center (CCRC) have been invited to co-sponsor this year's events.

**Wednesday, 31 August:** "Tactical EMS 2005" will commence with the 5th Annual "Medic Up" Competition. As the world's largest TEMS-specific competition, this exciting event will feature numerous four-member tactical elements and two-member medical elements from throughout the world merging into six-person teams and competing in four physically and mentally challenging scenarios. Competitors will be judged in individual events and the overall competition with all being evaluated on how well they can manage the "blood in the mud."

5th Annual "Medic Up" Competition

#### **The Events**

##### **Event 1- Dynamic Entry**

While participating in a dynamic entry, competing teams may be engaged by a threat. Teams will be expected to address any pre-existing or spontaneous threats and assess, triage, treat, and extract any casualties.

##### **Event 2- Victim Rescue**

After performing a remote assessment of a casualty and attempting a rescue, competing teams may be engaged by a threat. Teams will be expected to address any pre-existing or spontaneous threats and assess, triage, treat, and extract any casualties.

##### **Event 3- Extraordinary Deployment**

While participating in an extraordinary deployment as members of a "rescue team," competing teams may encounter multiple casualties. Teams will be expected to address any pre-existing or spontaneous threats and assess, triage, treat, and extract any casualties.

##### **Event 4- "The Gauntlet"**

This is a timed event that will feature an obstacle course with seven casualty management stations. The stations are:

- Bleeding Control
- Airway Management
- Ventilation



- Shock Management
- Splinting
- Spinal Immobilization
- Extraction

For information on entering a medical or tactical element in the 5th Annual “Medic Up” Competition, please visit the International Tactical EMS Association’s web site at [www.TEMS.org](http://www.TEMS.org) and click the “Tactical EMS 2005 Conference and Exposition” banner. Information may also be obtained by contacting the International Tactical EMS Association’s office at (248) 476-9077 or [TacticalEMS@aol.com](mailto:TacticalEMS@aol.com)

**Thursday, 1 September:** 12 dynamic full-day training programs will be offered. Led by some of the world’s most experienced Special Operations personnel and the “Tactical EMS 2005” cadre will present:

- How to Develop and Maintain a Tactical EMS Program
- Casualty Response Training Course
- Public Safety Commanders Course
- Medical Directors Course
- Immediate Action Drills for the Operator
- Essential Trauma Skills in the Tactical Environment
- Immediate Action Drills for the Tactical Medical Provider
- Immediate Reaction Team: A New Paradigm in Officer Rescue
- Manhunt Medicine: Managing a Medical Crisis in a Rural Environment
- Sports Medicine for the Tactical Athlete
- Expanded Scope of Care for the Tactical Paramedic
- K-9 Down! What Can You Do?

**Friday and Saturday, 2-3 September:** a general session conference will take place. It will include 16 hours of educational presentations and as many as 60 exhibits displaying a wide variety of emergency medical and law enforcement products, services, and training programs. Presentations will include:

- Advances in Hemostasis and Resuscitation: A Report From the United States Army Institute for Surgical Research
- Managing SWAT - Related Stress in Operators and Civilians During Special Operations
- Medical Assistance and Tactical Team: The Next Generation of Tactical Medical Response
- Medical Aspects of Counter-Terrorism in Israeli Special Operations
- Medical Aspects of Less Lethal Technology
- Medical Clearance for Incarceration
- Monitoring and Rehabilitation During the Selection Process: Lessons Learned From Naval Special Warfare
- Special Trauma and Rescue (STAR) Team Case Studies: 25 Years of Tactical Medicine in San Diego
- Stress Fracture Prevention, Evaluation and Comprehensive Treatment
- Suicide Awareness and Prevention
- Tactical Combat Casualty Care: An Overview
- Tactical EMS: How it Reduces a Law Enforcement Agency’s Liability Posture
- The First Marine Division in Iraq: Naval Medicine at the Tip of the Spear
- The Southern California Tactical Emergency Medical Support Task Force: A Success Story in Local, State and Federal Cooperation
- The State of California SWAT Project: Achieving Operational Guidelines And Standardized Training Recommendations
- Training Issues in Tactical Emergency Medical Support

Friday afternoon, an awards luncheon and keynote address will take place. Given the theme of the conference, Vice Admiral Richard H. Carmona, the United States Surgeon General, has been invited to be the keynote presenter. In addition, a retired United States Navy Hospital Corpsman and recipient of the Congressional Medal of Honor has been invited to be the conference's guest of honor.

For additional information on the “Tactical EMS 2005 Conference and Exposition”, please contact: Jim Etzin

Executive Director, International Tactical EMS Association

Office: (248) 476-9077; Cellular: (248) 842-7044; Pager: (248) 316-0242; E-mail: [TacticalEMS@aol.com](mailto:TacticalEMS@aol.com)

## Special Operations Medical Associations Conference 2005

12-15 December 2005

Marriott Waterside Hotel - Tampa, FL

[www.somaonline.org](http://www.somaonline.org) or [www.tacticalmedic.org](http://www.tacticalmedic.org)

The Special Operations Medical Association's annual conference is meeting in Tampa, FL 12-15 December 2005. Please note that this year's conference is meeting at the Marriott Waterside Hotel and will focus on challenges and solutions of the Special Operations "first responder" and "first receiver." There will be many more NCOs presenting and more presentations on Combat Lessons Learned. We are still finalizing some additional optional break out sessions.

SOMA has a new web site with two Internet addresses; [www.somaonline.org](http://www.somaonline.org) or [www.tacticalmedic.org](http://www.tacticalmedic.org) and are actively making more improvements to it. To log in, if you are a member, use the first letter of your first name and your last name. For example, Alan Moloff would log on as amoloff. The password for everyone is password1. Both the log on and password are in lower-case. Please check the website for all conference information, registration, and agenda.

If you are a SOMA member and have not received the last issue of JSOM (Spring 2005) or have moved since last December 2004, PLEASE send an email with your current address to: Russ Justice at [justicer@earthlink.net](mailto:justicer@earthlink.net) and April Porter at [HELLzPrwln@aol.com](mailto:HELLzPrwln@aol.com). Please note that SOMA is a private, tax-exempt organization and is not affiliated with the United States Special Operations Command.



## **Tactical Element Courses**

For additional information on the following courses offered by Tactical Element, please visit online at [www.tacticalelement.cc](http://www.tacticalelement.cc). Course announcements and course registration forms may be obtained by e-mailing [info@tacticalelement.cc](mailto:info@tacticalelement.cc).

### **2005 TRAINING COURSES, DATES, AND LOCATIONS**

#### **Tactical Emergency Medical Operator**

##### **5-9 SEP 05 / TEMO-05-03**

Army National Guard Maneuver Training Center  
Camp Ripley  
Little Falls, Minnesota

##### **12-16 SEP 05 / TEMO-05-04**

Camp Blanding Training Site  
Starke, Florida

##### **5-9 DEC 05 / TEMO-05-05 Starke, Florida**

Camp Blanding Training Site  
Starke, Florida

Tactical Emergency Medical Operator (TEMO) is a five day program of instruction preparing law enforcement officers, security specialist, fire fighters, and emergency medical services personnel assigned to and/or supporting law enforcement and/or military special operations in a multitude of urban, rural, austere, and remote environments. TEMO targets operators and support personnel of tactical operations or special operations teams, delivered in 48 hours of day and night operations comprised of classroom lecture and practicum, followed by field training exercises. TEMO continues forward regardless the weather. How you train is how you perform!

Course topics include but are not limited to:

- Advanced Airway Techniques
- Anti-Personnel Devices (including Improvised Explosive Devices)
- Aspects of Wound Ballistics
- Tactical Operations (TACOPS)
- Command and Control (C2)
- Tactical Operations
- Urban Combat Skills
- Rural Combat Skills
- Medical Force Protection
- Role and Responsibilities of the Tactical Emergency Medical Operator
- Load-out and Equipment Considerations
- Mission Development
- Pre-Mission Medical Threat Assessment
- Remote Assessment / Remote Mentoring
- Tactical Combat Casualty Care

#### **Tactical Search and Rescue (TACSAR)**

##### **12-16 DEC 05**

Minnesota Army National Guard Maneuver Training Center  
Camp Ripley  
Little Falls, Minnesota

Tactical Search and Rescue (TACSAR) provides the knowledge, skills, responsibilities, and the equipment required for operators who are assigned to field operations during a tactical search and rescue mission. The TACSAR program of instruction also provides student with field training exercises and missions where the students are required to possess the prescribed equipment during daylight and nighttime field operations. Four major areas of instruction include: survival, search, rescue, self-aid, and casualty care. Casualty care and self-aid focus on the rural austere tactical environments.

Furthermore, TACSAR provides training for new operators and allows them to accumulate the required clothing and equipment needed for tactical search and rescue operations. The program also gives the student practical experience during simulated search and rescue operations. In many cases TACSAR provides as an excellent refresher course for the more experienced operator including leadership.

TACSAR is a five day, full dress, full load-out program of instruction and targets medical operators and non-medical operators, delivered in forty-five (45) hours of day and night operations comprised of field lecture and practicum. In addition to receiving the Tactical Element Certificate of Training, students also earn the American Safety & Health Institute two year Wilderness First Aid certification. The outdoors is the classroom regardless the weather. How you train is how you perform!

Course topics include but are not limited to:

- Patrolling (mounted or dismounted)
- Anti-Personnel Device (APD) Recognition
- Camouflage, Cover, & Concealment
- Load-out and Equipment Considerations
- Rural Tactical Environmental & Preventative Medicine
- Land Navigation (LANDNAV)
- Basic Survival Skills
- Rural Combat Skills
- Mission Development / Preparedness
- Pre-Mission Medical Threat Assessment
- Tactical Search and Rescue
- Tactical Combat Casualty Care
- Casualty Extraction
- Casualty Evacuation (CASEVAC)

TACSAR is offered in two specific presentations:

Dismounted (ground special/tactical operations teams)

Mounted (posse or equine unit)

### **Special Operations Casualty Management**

#### **6-8 SEP 05**

Minnesota Army National Guard Maneuver Training Center

Camp Ripley

Little Falls, Minnesota

#### **13-15 SEP 05**

Camp Blanding Training Site

Starke, Florida

#### **6-8 DEC 05**

Camp Blanding Training Site

Starke, Florida

#### **13-15 DEC 05**

Minnesota Army National Guard Maneuver Training Center

Camp Ripley

Little Falls, Minnesota



Special Operations Casualty Management (SOCM) is an intense three day program of instruction providing the tactical operator possessing limited or no prior medical training the necessary concepts and skills to deliver casualty care during special operations. With the potential for effective hostile fire/threat, the Special Operations Casualty Management course enables the non-medical personnel to apply practical lifesaving techniques and basic level medical knowledge, skills, and equipment familiarity required to mitigate casualty care until the arrival of advanced medical care or until the casualty can be safely extracted to a receiving medical treatment facility.

Personnel may be required to respond immediately to any casualty situation during tactical operations. This training is particularly applicable to personnel deployed to remote sites or operating in denied environments including small unit tactical operations. This training provides instruction and practical application of casualty assessment, identification, and treatment of common traumatic injuries, and management of common operational medical considerations.

Training consists of twenty-four (24) hours of instruction. Skill labs follow lectures to reinforce the modular instruction. Training also includes essential skills utilization in scenarios frequently encountered during the individual's performance of duty, as well as practical skills applications during performance labs.

### **Protective Operations Medical Specialist**

#### **3-7 OCT**

Butler County Community College  
Public Safety Training Facility  
Butler, Pennsylvania

Protective Operations Medical Specialist (POMS) is a 40-hour program of instruction preparing medical personnel to address casualty care in the protective operations environment conducive of domestic environments and international.

This course was specifically developed as a result of actions encountered by Operator/Medics of Tactical Element while on assignment in Iraq and to prepare personnel desiring to deploy to protective operations teams.

The severe lack of resources available to protective operations personnel adds an incredible burden to the already dangerous conditions encountered by teams as they are tasked with protecting executive principals and assets. This forces the prospective protective operations medical specialist to prepare for the worst possible conditions.

The student will experience intense training in both non-tactical and tactical environments as it applies to protection and casualty care of principals, team members, and mass casualty (MASCAL) incidents.

Course topics include but are not limited to:

- Medical oversight
- Protective operations medical support
- Load-out and equipment considerations
- Security advances
- Route surveys
- Pre-mission medical threat assessment
- Travel medicine
- Ballistic wounding
- Tactical combat casualty care
- Casualty extraction and evacuation (CASEVAC)
- Entry and exit drills
- Case studies

**S.E.R.T. Group International**  
**Specialized Emergency Response Team**

Scott Sheldon - President

P.O. Box 371231

Reseda, CA 91337-1231

Ph: 866/500-5465

**SPECIAL OPERATIONS MEDICAL COURSES**

**Tactical Operations Medical Specialist**

This high-speed, low-drag course covers the skills necessary to provide emergency medical care in the austere environment. Consisting of classroom, skills stations, and very realistic scenarios this course will provide a new Tactical Medical operator with the training necessary to support a SPECOPS team during operations and training. Course length is 5 days.

Curriculum Includes:

- Tactical Combat Casualty Care
- Role/Responsibility of TEMS provider
- Medical Threat Assessment
- Ballistics
- Team Health
- Buddy Care
- Clan Labs
- Dental Care
- Pediatric Trauma
- Entry / Room Clearing Techniques
- Rescue Techniques
- Field Training Exercise

**Special Operations Medical Provider**

The course covers basic elements of providing operational emergency medical care in the austere environment. This offers the medical operator options for treating casualties in the tactical or combat environments. Course length is 3 days

Curriculum Includes:

- Tactical Combat Casualty Care
- Medical Threat Assessment
- Ballistics
- Team Health
- Buddy Care
- Rescue Techniques

**Pediatric Trauma in Tactical Operations**

**Prerequisite: Assignment or intent to provide medical care in tactical operations.**

This course addresses the unique medical needs of the pediatric trauma victim. As noted in Operation Iraqi Freedom, kids pose a unique challenge to medical providers. Following the axiom that “kids are not small adults,” this course will present assessment and treatment options for those children injured during tactical or combat operations.

Curriculum Includes:

- Kids and Combat Operations - A Primer
- The PALS paradigm
- Patterns of injury
- Treatment Options
- Skills
- Real World Scenarios

**The following is a list of information resources for continuing education.**

Casualty Care Research Center  
Department of Military and Emergency Medicine  
Uniformed Services University  
4301 Jones Bridge Road  
Bethesda, Maryland, United States 20814-4799  
Office: (301) 295-6263  
Fax: (301) 295-6718  
Web Site: [www.casualtycareresearchcenter.org](http://www.casualtycareresearchcenter.org)

CERTAC  
P.O. Box 354  
Drake, Colorado, United States 80515  
Office: (970) 214-9355  
Fax: None  
Web Site: [www.certac.com](http://www.certac.com)

Counter Force Training  
3160 School Drive  
Savanna, Illinois, United States 61074  
Office: (888) 660-3442  
Fax: (815) 273-3247  
Web Site: [www.counterforcetraining.org](http://www.counterforcetraining.org)

Cypress Creek Advanced Tactical Team  
c/o Cypress Creek EMS  
16650 Sugar Pine Lane  
Houston, Texas, United States 77090  
Office: (281) 440-9650 Extension 156  
Fax: (281) 440-7677  
Web Site: [www.ccatt.org](http://www.ccatt.org)

Direct Action Resource Center  
6302 Valentine Road  
North Little Rock, Arkansas, United States 72117  
Office: (501) 955-0007  
Fax: (501) 955-0080  
Web Site: <http://www.darcl.com>

Gunsite Academy, Inc.  
2900 West Gunsite Road  
Paulden, Arizona, United States 86334  
Office: (928) 636-4565  
Fax: (928) 636-1236  
Web Site: <http://www.gunsite.com>

Heckler & Koch, Inc.  
International Training Division  
21480 Pacific Boulevard  
Sterling, Virginia, United States 20166-8903  
Office: (703) 450-1900 Extension 293  
Fax: (703) 406-2361  
Web Site: <http://www.tacticalmedicine.com/>

HSS International, Inc.  
P.O. Box 50 / # 337  
Lake Arrowhead, California, United States 92352  
Office: (909) 336-4450  
Fax: (714) 242-1312  
Web Site: <http://www.hssinternational.com>

Insights Training Center  
P.O. Box 3585  
Bellevue, Washington, United States 98009  
Office: (425) 827-2552  
Fax: (425) 827-2552  
Web Site: <http://www.insightstraining.com>

Lion Claw Tactical  
5900 East Virginia Beach Boulevard  
Suite 408  
Norfolk, Virginia, United States 23502  
Office: (757) 321-2059  
Fax: (757) 498-0059  
Web Site: [www.lionclawtactical.com](http://www.lionclawtactical.com)

“Medic Up” Tactical Medic Training Course  
3300 Via Giovanni  
Corona, California, United States 92881  
Office: (909) 340-9201  
Fax: (909) 340-9201  
Web Site: [www.medicup.com](http://www.medicup.com)

National Academy of Tactical Medical Response  
3075 Shattuck Road  
Suite 813  
Saginaw, Michigan, United States 48603-3258  
Office: (989) 585-4001  
Fax: (989) 585-4001  
Web Site: [www.tacticalmedical.com](http://www.tacticalmedical.com)

National Tactical Officer's Association  
P.O. Box 797  
Doylestown, Pennsylvania, United States 18901  
Office: (800) 279-9127  
Fax: (215) 230-7552  
Web Site: <http://www.ntoa.org>

NWTC, Inc.  
1844 North Nob Hill Road  
Suite 406  
Plantation, Florida, United States 33322  
Office: (866) 328-2918  
Fax: (866) 328-2918  
Web Site: [www.nwtcinc.org](http://www.nwtcinc.org)

Omega Tactical Consultants  
7915 Trail Run Loop  
New Port Richey, Florida, United States 34653  
Office: (727) 243-6891  
Fax: (727) 375-1577  
Web Site: [www.omegatacticalconsultants.com](http://www.omegatacticalconsultants.com)

Rescue Training, Inc.  
9-A Mall Terrace  
Savannah, Georgia, United States 31406  
Office: (877) 692-8911  
Fax: (912) 692-1338  
Web Site: <http://www.emtt.org>

Spartan Group International  
Applied Training and Consulting Division  
P.O. Box 671  
Mamers, North Carolina, United States 27552  
Office: (877) 977-2782  
Fax: None  
Web Site: <http://www.spartangroup.com>

SERT Group International  
P.O. Box 371231  
Reseda, California, United States, 91337-1231  
Office: (866) 500-5465  
Fax: (818) 344-8099  
Web Site: <http://thesertgroup.homestead.com>

Specialized Medical Operations, Inc.  
P.O. Box 530520  
Henderson, Nevada, United States 89053  
Office: (702) 617-1655  
Fax: (702) 920-7635  
Web Site: [www.specmedops.com](http://www.specmedops.com)

Special Operations Tactical Training International  
P.O. Box 830  
Dover, Tennessee, United States 37058-2716  
Office: (931) 232-6593  
Fax: (931) 232-6542  
Web Site: [www.sottint.com](http://www.sottint.com)

STS Consulting  
PMB Box 176  
1981 Memorial Drive  
Chicopee, Massachusetts, United States 01020  
Office: (413) 531-8699  
Fax: (413) 532-1697  
Web Site: [www.tactical-ems.com](http://www.tactical-ems.com)

Tac1Aid  
157 Middle Road  
Newbury, Massachusetts, United States 01922  
Office: (978) 499-0492  
Fax: None

E-mail: [Tac1Aid@hotmail.com](mailto:Tac1Aid@hotmail.com)  
Tactical Element, Inc.  
380-H Knollwood Street  
Suite 140  
Winston Salem, North Carolina, United States 27103  
Office: (336) 945-2289  
Fax: (336) 945-2289  
Web Site: [www.tacticalelement.cc](http://www.tacticalelement.cc)

Team One Network  
620 Richards Ferry Road  
Fredericksburg, Virginia, United States 22406  
Office: (540) 752-8190  
Fax: (540) 752-8192  
Web Site: [www.teamonenetwork.com](http://www.teamonenetwork.com)

The Tactical EMS School  
1309 Dawn Ridge Road  
Columbia, Missouri, United States 65202  
Office: (573) 474-2436  
Fax: (573) 474-2436  
Web Site: [www.tactical-specialties.com](http://www.tactical-specialties.com)

X-TEMS  
P.O. Box 925  
Loveland, Ohio, United States 45140  
Office: (513) 583-3001 Extension 500  
Fax: (513) 583-3012  
Web Site: [www.xtems4life.com](http://www.xtems4life.com)

## **VETERINARY MEDICINE**

K-911 Emergencies, Inc.  
P.O. Box 8652  
Jupiter, Florida, United States 33468-8652  
Office: (561) 575-2514  
Fax: None  
Web Site: [www.k911emergencies.com](http://www.k911emergencies.com)

The ResQ Shop  
1051 Meadow West Drive  
El Paso, Texas, United States 79932  
Office: (915) 877-4312  
Fax: (915) 877-4242  
Web Site: [www.theresqshop.com](http://www.theresqshop.com)

University of Florida  
Department of Small Animal Clinical Sciences  
2015 Southwest 16th Avenue  
Gainesville, Florida, United States 32610  
Office: (352) 392-4700 Extension 5700  
Fax: (352) 392-6125  
Web Site: [www.doce-conferences.ufl.edu/k9](http://www.doce-conferences.ufl.edu/k9)



# SOF RELATED BOOK LIST

The following is a compiled list of SOF related books recommended for your reading by those who were there. The list is complements of Len Blessing with the assistance of all of you. If anyone has other books they would like to add to the list, let us know. I have not read each selection personally. Its intent is to present a concise list of the vast array of reading material available that pertains to the mission of Special Operations - both past and present.

Every attempt is made to maintain the list's integrity with respected and legitimate works. Readers who feel a selection does not merit inclusion are encouraged to contact me with disputes. I also strongly encourage readers to write a short review for the books they have read and/or have personal first hand knowledge concerning a specific selection. This will help maintain a high degree of content validity.

I am happy to submit your comments/reviews on your behalf if you prefer to not write directly to the JSOM editor staff. I can be contacted at lenblessing@comcast.net.

Len Blessing

TITLE	AUTHOR
00:19:57	Dave F Stafford
A Concise History of U.S. Army Special Operations Forces, with Lineage and Insignia	Geoffrey T Barker
A Tear For Somalia	Douglas T Collins
(Written by a Brit who married a Somali woman while serving as a member of the British Camel Corps after the end of WWII. Not a history, but it does give insight into Somali society.)	
A Very Short War	John F Guilmartin Jr
(About the last gunfight and the last sacrifices of the Vietnam-era war in the recovery of the crew and ship SS Mayaguez in 1975.)	
About Face	David H Hackworth (Col)
Advice and Support: The Early Years	Ronald H Spector
Airborne and "Special Forces"	Hans Halberstadt
(non-fiction, good quick references, especially for family or civilians)	
American Guerrilla	Unknown
(WW II U.S. led guerrillas in Phillipines)	
Band of Brothers	Stephen Ambrose
(A great story about "E" Company, 506th PIR, 101st ABN Division in WWII.)	
Battle for the Central Highlands: A Special Forces Story	George E Dooley
Beyond Nam Dong	Roger Donlon
Black Eagles	Larry Collins
(Fiction)	
Blackburns Headhunters	COL Donald Blackburn
(Part of a series of books on the area from Turkey to Tibet. Well researched and an excellent view of the region, its history, and various societies that live within the region.)	
Blackjack -33: With Special Forces in the Viet Cong Forbidden Zone	James C Donahue
Blackjack -34 (Previously titled "No Greater Love")	James C Donahue
Bravo Two Zero	Andy McNab
Break Contact Continue Mission	Raymond D Harris
(Fiction)	
Bunard: Diary of a Green Beret	Larry Crile
Che Guevarra on Guerrilla Warfare	Ernesto Gueverra
Code Name Bright Light	George J Veith
Code Name:Copperhead	Joe R Garner (SGM Ret)
Covert Warrior	Warner Smith
Danger Close	Mike Yon
(Non-fiction. SF member charged with murder in a bar fight within 3 days of graduation from the Q Course.)	
Edward Lansdale: The Unquiet American	Cecil B Currey
Elite Warrior	Lance Q Zedric

TITLE	AUTHOR
Fighting Men: Stories of Soldiering	Jim Morris
Fire Your FPL's	Mike Di Rocco
Five Fingers	Gayle Rivers
Five Years To Freedom	James N Rowe
Flags of our Fathers	James Bradley & Ron Powers
Foreign Devils on the Silk Road	Peter Hopkirk
(Part of a series of books on the area from Turkey to Tibet. Well researched and an excellent view of the region, its history, and various societies that live within the region.)	
From OSS to Green Berets	Aron Bank (COL Ret)
Ghost Soldiers: The Epic Account of World War II's Most Dramatic Mission	Hampton Sides
(Ranger operation to free POWs in the Philippines)	
Greatest Rescue Mission	
(Ranger operation to free POWs in the Philippines)	
Green Berets At War	Shelby L Stanton
Green Berets at War: U.S. Army Special Forces in Asia 1956-1975	Shelby L Stanton
Green Berets in the Vanguard: Inside Special Forces 1953-1963	Chalmers Archer Jr
Guerrilla Warfare: On Guerrilla Warfare	Mao Tse tung
Hard To Forget	Steven M Yedinak
Hazardous Duty	Jack Singlaub (MG Ret)
Hazardous Duty	David H Hackworth (COL) & Tom Mathews
	Bernard Fall
Hell In A Very Small Place	
(Siege of Dien Bien Phu)	
Ho Chi Minh: A Life	William J Durker
Hunting The Jackal	Billy Waugh
In The Village of the Man	Loyd Little
Inside Al Qaeda, Global Network of Terror	Rohan Gunaratna
Inside Delta Force: The story of America's elite counterterrorist unit	Eric L Haney
Inside the Green Berets: The First Thirty Years	Charles M Simpson III
It Doesn't Take A Hero	Norman H Schwarzkopf (GEN Ret) & Peter Petre
	Mark Bowden
Killing Pablo: The Hunt for the World's Greatest Outlaw	
(Read by current SF medic that knows some of the guys involved in getting Pablo; told him that the book is pretty accurate, except what happened in the actual killing.)	
Knights Cross	E M Nathanson & Aaron Bank (COL Ret)
Laos: War and Revolution	Nina S Adams (Ed)
Like Hidden Fire	Peter Hopkirk
(Part of a series of books on the area from Turkey to Tibet. Well researched and an excellent view of the region, its history, and various societies that live within the region.)	
Logistical Support of Special Operations Forces During Operations Desert Shield and Desert Storm	Donald W Betts
Long Shadows	
(Fiction)	Kent White
Lost Crusade: America's Secret Cambodian Mercenaries	Peter Scott
Lost Crusader: The Secret Wars of CIA Director William Colby	John Prados
Love and Duty	Ben & Anne Purcell
MAC-V-SOG Command History Vol. I & II	Charles F Reske
Medal Of Honor	Roy P Benavidez
Memories Of Maggie: Martha Raye: A Legend Spanning Three Wars	Noonie Fortin
Mike Force	LH Burrus
Mobile Guerrilla Force: Wth the Special Forces in Warzon D	James C Donahue
My American Journey	Colin Powell (GEN Ret) & Joseph E Persico
	Richard S Drury
My Secret War	Thomas B Bennett
Night Jungle Operations	

TITLE	AUTHOR
Night of the Silver Starts: The Battle of Lang Vei No Surrender (Japanese soldier who evaded capture and survived 30 years in the Philippines; it's a great book about perseverance and commitment to warrior ideals.)	William R Phillips Hiroo Onoda
Once A Warrior King: Memories of an Officer in Vietnam	David Donovan
One Day Too Long	Timothy N Castle
O O T W Target Cuba	Robin Moore & JC Lamb
Operation Vulture	John Prados
OSS to Green Berets	Aaron Bank (COL Ret)
Parthian Shot	Loyd Little
Pathfinder: First In, Last Out (A very well written account of Richie Burns' first tour in RVN, during which he provided support to a Mike Force mission, and which describes other activities very similar to SF missions during the war.)	Richard C Burns
Peoples' War, Peoples' Army	Vo Nguyen Giap
Perilous Options: Special Operations as an Instrument of U.S. Foreign Policy	Lucien S Vandenbroucke
Phantom Warriors, Book II	Gary A Linderer
Phantom Warriors: LRRPs, LRP's, and Rangers in Vietnam, Book I	Gary A Linderer
Prairie Fire (Fiction)	Kent White
Presidents' Secret Wars: CIA and Pentagon Covert Operations from World War II Through the Persian Gulf	John Prados
Project Omega: Eye of the Beast	Ernie Acre
Rangers at War: Combat Recon in Vietnam	Shelby L Stanton
Reflections Of A Warrior	Franklin D Miller
Rescue Of River City	Drew Dix
Return of The Enola Gay	Paul W Tibbets
Return With Honor	Scott O'Grady (Capt) & Jeff Coplon
Setting the East Ablaze (Part of a series of books on the area from Turkey to Tibet. Well researched and an excellent view of the region, its history, and various societies that live within the region.)	Peter Hopkirk
Seven Pillars of Wisdom (Middle East insight)	TE Lawrence
SF Bibliography: Collection of articles and other readings with Special Forces topics	Radix Press/Dan Godbee
Shadow War: Special Operations and Low Intensity Conflict	HT Hayden
Shadow Warriors: Inside the Special Forces	Carl Stiner & Tomy Koltz
Sideshow (The U.S., Khymer Rouge, & Cambodia)	Robert Showcross
Silent Birdmen (281st AHC pilot account; Project Delta Ops in Ashau Valley.)	Al Rampone
Slow Walk In A Sad Rain	John P McAfee
SOG and SOG Photo Book	John Plaster
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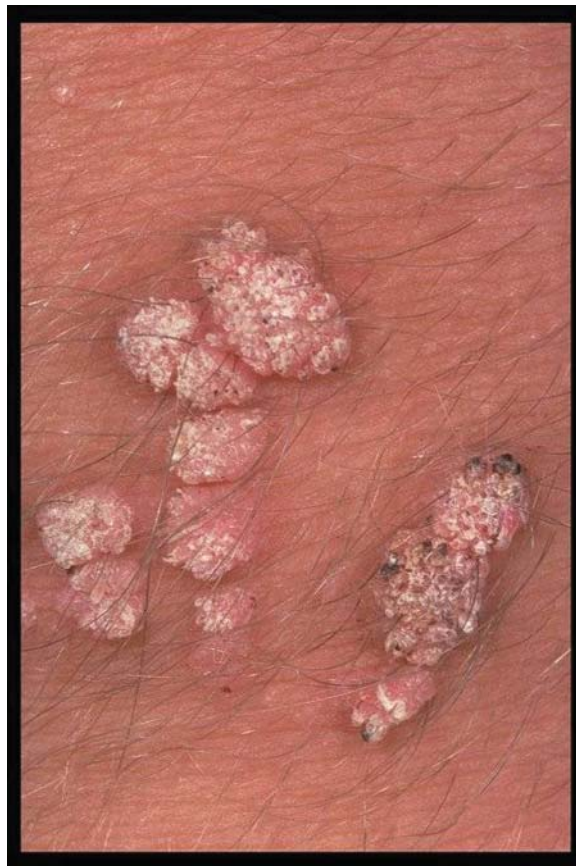
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## Picture This....

David Doyle, MD

A 31 year-old active-duty male Soldier complains of a painless group of “bumps” on his forearm present for several months. The Soldier tells you he originally had one “bump,” and over a few months others appeared.



- 1) How would you describe the morphology of these lesions?
- 2) What is your differential diagnosis for these lesions?

## ANSWERS

1) Morphology: These are hyperkeratotic, exophytic, verruciform papules with punctuate black dots (these correspond to thrombosed capillaries).

2) Your differential diagnoses should include common warts, seborrheic keratoses, acrochordons, squamous cell carcinoma, linear lichen planus, and linear psoriasis. Seborrheic keratoses tend to appear as light brown, “stuck-on” appearing papules which occur most often on the head, neck, face, and upper back. Acrochordons (also referred to as skin tags) tend to be soft, pedunculated, skin-colored to lightly pigmented exophytic lesions which occur most commonly on the neck, axilla, and groin. Squamous cell carcinoma most commonly appears on sun-exposed skin of the elderly as a single nodule. Linear lichen planus and linear psoriasis are chronic dermatoses and are composed of erythematous papules with scale.

## COMMON WARTS (HUMAN PAPILLOMA VIRUS)

### EPIDEMIOLOGY

Common warts, referred to as verrucae vulgares (singular: verruca vulgaris), are one of the most frequent skin manifestations of infection with human papilloma virus (HPV). HPVs are a large group of DNA viruses (Papovaviridae family), with approximately 100 identified genotypes causing predominantly benign papillomas (warts) of the skin and mucous membranes.<sup>1</sup> HPVs also cause condylomata acuminata (aka genital or venereal warts). Although most infections with HPV lead to benign skin disease, there is a well-documented association with certain HPV sub-types with cervical and anogenital cancers.<sup>2</sup>

### ETIOLOGY/PATHOGENESIS<sup>3</sup>

Infection with HPV most commonly occurs from direct skin-to-skin contact with individuals with clinical or sub-clinical HPV infection. It is also possible to become indirectly infected by way of contaminated objects such as gymnasium equipment or shared personal hygiene products such as razors (also known as fomite transmission). The basal keratinocytes, which make up the deepest layer of cells in the epidermis, are the target cells of HPVs. HPVs require an abrasion or “break” in the skin to infect their target cells. Therefore areas of repeated trauma or rubbing are likely sites of HPV infection. The high prevalence rate of genital HPV is of concern as there is no 100% effective method to prevent transmission (condoms do not prevent all cases of transmission although they may decrease the rate), other than abstinence. There is also no cure for HPV infection although there are multiple treatments which can be effective in reducing the appearance of clinical lesions.

### CLINICAL<sup>3</sup>

HPV causes an impressively wide variety of skin and mucosal lesions.

Skin lesions include common warts, palmar and plantar warts, myrmecial warts (painful, deep-growing plantar wart), mosaic warts (many plantar warts coming together to form a large plaque-like wart), flat warts, and Butcher’s warts (cauliflower-like lesions on the hands/fingers). Some skin HPV infections can be a risk factor for squamous cell carcinoma, although this is rare and occurs most commonly in the elderly.

Mucosal lesions include condylomata acuminata (genital warts) and high-grade intraepithelial neoplasias (risks for cervical cancer and penile cancers), as well as respiratory tract papillomatosis and conjunctival papillomas.

Areas of repeated trauma or excessive rubbing are more prone to infection with HPV. Likely body locations to see common warts include hands, fingers, elbows, knees, and the plantar aspects of the feet. Common locations for sexually transmitted HPV include the penile shaft and glans, vulva, perineum, and perianally.

It is imperative when discussing HPV with your patients to educate them that subclinical HPV infections are very common, and that individuals with subclinical HPV infections can transmit the virus to their close contacts. Young adults should be counseled that absence of visible lesions upon inspection of a sexual

partner's genitalia does not rule out the possibility of a subclinical HPV infection. Young adults should be further counseled that condoms provide only some protection from sexually transmitted HPV, but HPV can still be transmitted even when condoms are properly worn. All post-menarchial patients should be encouraged to have annual well-woman exams including Pap smears, as certain HPV types transmitted by sexual intercourse are known risk factors for cervical cancer.

## THERAPY

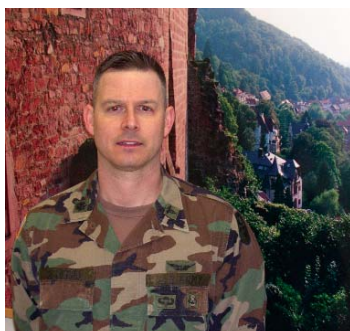
There is currently no cure for HPV infection and infected individuals likely harbor the virus indefinitely. Treatments for HPV infections aim to destroy or remove the visible lesion and to induce the immune system to attack the virus. There are many ways to treat common warts and only a few of these treatments will be outlined in this article. For most wart treatments, efficacy can be increased by paring down or shaving down the lesion prior to treatment. Many clinicians will pare down the lesion during the office visit, and then encourage the patient to continue paring down the lesion from time to time on their own. Once pared down, the warts can then be treated by occlusion with an over-the-counter salicylic acid patch or even duct tape, keeping the lesion covered most hours of the day. Liquid nitrogen therapy, if available, is also fairly effective and there is now an over-the-counter product that also works by freezing the lesions called Compound W Freeze Off. It is not uncommon for a patient with several warts to see regression of untreated warts when the biggest or "mother" wart is successfully treated. If destructive and/or occlusive therapy is unsuccessful, then referral to a primary care physician for other options may be appropriate. It is important that all cases of anogenital warts be evaluated for other STDs.

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CPT David Doyle, Jr. is a Notre Dame alumnus and a 2000 graduate of the University of Texas Medical Branch at Galveston. CPT Doyle served as a paratrooper and flight surgeon in the 82D ABN DIV 2001-2004, and earned Bronze Star Medals for service during OEF in Afghanistan and OIF in Iraq. CPT Doyle is currently a second year resident in the combined Army & Air Force Dermatology program at Brooke Army Medical Center (Ft. Sam Houston) and Wilford Hall Medical Center (Lackland AFB).



LTC Daniel Schissel originated "Picture This" for the MED Quiz. He is a 1993 graduate of the Uniformed Services University of the Health Sciences and completed his internship with the family practice department at Fort Bragg in 1994. He then served as the 2/10th Special Forces Group (Airborne) surgeon and followed on as the 10th SFG(A) Group Surgeon. He completed his residency training in dermatology at the Brooke Army Medical Center in 1999. LTC Schissel is presently station in Heidelberg, Germany as a staff physician and the European Regional Medical Command Dermatology Consultant. He has authored the dermatology section of the new SOF manual, serves on the USSO-COM Medical Curriculum and Examinations Board, and is the U.S. Army Aviation Dermatology Consultant.



## *Photo Gallery*



Treating local boy in Afghanistan



PA treating local mulla in Afghanistan



18D "Jodie" treating a burn Afghanistan



PA treating local mulla in Afghanistan

# *Taps*

The following article by Andy Serwer, Reporter Associate Kate Bonamici; and Reporter Associate Doris Burke was retrieved from the Wealth News website. "Growing Up Walton" dated November 15, 2004, U.S. Edition The Waltons granted FORTUNE an interview. All told, FORTUNE spent over a year reporting this story, speaking with scores of sources across the country. The result is the most complete picture to date of the Waltons, Wal-Mart's first family of American business.

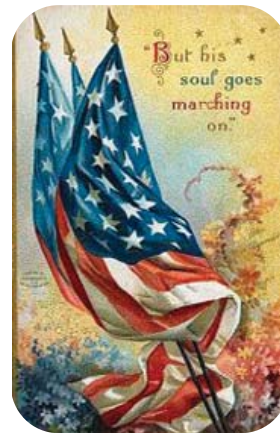
John Walton was a Green Beret, an SF Medic assigned to Military Assistance Command - Vietnam - Studies and Observations Group (MAC-V-SOG). SOG often conducted actions behind enemy lines and in Laos and Cambodia. John joined the unit in 1968, right after the Tet Offensive. On almost every mission there was a firefight. A particularly horrifying battle occurred in the A Shau Valley in Laos while he was assigned to a unit named strike team (ST) Louisiana. John was the commando team's No. 2 man as well as its medic. One morning ST Louisiana was dropped from helicopters onto a ridge near the DMZ and was attacked by North Vietnamese Army Soldiers. In a memoir titled "Across the Fence: The Secret War in Vietnam", fellow Green Beret John Stryker Meyer gives an account of that day: "Four of the NVA's rounds struck the tail gunner, wounding him severely. As Walton swung his CAR-15 (a submachine gun version of the M-16) toward the enemy soldier ... [his] rounds hit the NVA Soldier and drove him back in the jungle." The account goes on to say that Walton's commanding officer, Wilbur "Pete" Boggs, called in a napalm strike that landed yards away from John. Soon the six-man team was surrounded. One was dead and three were wounded. John tended to casualties, including Boggs, who was knocked semiconscious by shrapnel, and Tom Cunningham, who was badly hurt. The knee got blown out and started hemorrhaging severely. John Walton applied a tourniquet to my leg to stop the severe hemorrhaging, recalls Cunningham today. John called in two choppers for extraction. As the first Kingbee dropped in and lifted off with some of the men, the NVA intensified its assault. A second chopper was needed to get all the men out, but the landing zone was too hot to make it in. Walton and his team thought they were doomed, but suddenly the first chopper came back down, even though their added weight might make it too heavy to take off again. With the enemy advancing into the clearing, firing at the helicopter, and Walton trying to keep Cunningham alive, the Kingbee took off and barely made it over the treetops. Cunningham and Boggs survived, though Cunningham lost his leg. That night while John was playing poker, someone pointed out that he had a flesh wound across his right wrist. A round fired by the NVA soldier John had killed had creased his skin. Later John was awarded the Silver Star. "If I were on the committee I wouldn't have given it to me," says John. "There were people doing things like that all around." How do you come back from that to a world of garden hoses and toothpaste and everyday low prices? Sam and the family wanted John to join Wal-Mart, but the only job John felt comfortable with was as company pilot. Even that proved too confining. John set out on his own and started a crop-dusting business in Texas and Arizona. Crop-dusting may sound like an innocent enough occupation, but it's actually sort of an excuse to fly daredevil tricks in a single-engine aircraft all day. (It's also kind of like doing bombing runs over and over.) You swoop down way low over Farmer Brown's alfalfa field—nearly touching the leafy green for half a mile or so—and then pull up, up, up to clear the wires at the end of the field—and then repeat. Crop-dusting was a fine way for John to reacclimate himself to civilian life, but there are only so many years a man can do that. Next, the sea called him. "I started a boat-building business in California, Corsair Marine. We built Trimaran sailboats. The company is still going, an Australian bought it several years ago." Meanwhile, John married, divorced, remarried, and had a son. Eventually, though, Wal-Mart pulled John back. "It was around 1990. Dad was still alive. I had been running the flying services and the boat-building operation for a while, and was starting to do some other investments, and had been making some trips with Dad, and he asked me whether I'd be interested in being on the board. I jumped at the chance."

Wal-Mart heir John T. Walton was listed by Forbes magazine as No. 11 on its list of the world's richest people with a net worth of \$18.2 billion. Walton founded the Children's Scholarship Fund in 1998 to provide low-income families with money to send their children to private schools. The foundation started with \$67 million from the Walton Family Foundation and benefited more than 67,000 children. John died as a result of a plane crash in a homemade, experimental aircraft shortly after take-off 27 June 2005 from Jackson Hole Airport in Grand Teton National Park. He was 58.

# Dedication



**Sergeant First Class Allen C. Johnson**



Sergeant First Class Allen C. Johnson, a Special Forces medical sergeant, assigned to 1st Battalion, 7th Special Forces Group, at Fort Bragg, died 26 April 2005 while supporting Operation Enduring Freedom. SFC Johnson, 31, of Los Molinos, CA, was shot and killed when his unit was ambushed by guerrillas while on patrol near Khanaqin in Afghanistan, a town southwest of the capital, Kabul. He died of injuries sustained from small arms fire.

Johnson joined the Army in 1991 as an infantryman. His first assignment was with the 2nd Battalion, 75th Ranger Regiment at Fort Lewis, WA. He changed military jobs in 1996 and served as a corrections specialist at Fort Leavenworth, KS and as a military policeman with the 704th Military Police Battalion at Fort Lewis in 1998. In 2000, Johnson was selected for Special Forces training. Johnson's battalion deployed to Afghanistan in the fall.

His wife, SSG E. Johnson, was deployed to Iraq when she was notified of her husband's death.

Johnson was posthumously promoted to sergeant first class and awarded the Silver Star, the Bronze Star, the Purple Heart, the Meritorious Service Medal, and the Combat Medical Badge.

SFC Johnson is survived by his wife and two children.



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### Special Forces Aidman's Pledge

As a Special Forces Aidman of the United States Army, I pledge my honor and my conscience to the service of my country and the art of medicine. I recognize the responsibility which may be placed upon me for the health, and even lives, of others. I confess the limitation of my skill and knowledge in the caring for the sick and injured. I promise to follow the maxim "Primum non-ham"), and to seek the assistance of more competent medical authority whenever it is available. These confidences which come to me in my attendance on the sick, I will treat as secret. I recognize my responsibility to impart to others who seek the service of medicine such knowledge of its art and practice as I possess, and I resolve to continue to improve my capability to this purpose. As an American soldier, I have determined ultimately to place above all considerations of self the mission of my team and the cause of my nation.



### Pararescue Creed

I was that which others did not want to be. I went where others feared to go, and did what others failed to do. I asked nothing from those who gave nothing, And reluctantly accepted the thought of eternal loneliness....should I fail. I have seen the face of terror; felt the sting of cold of fear, and enjoyed the sweet taste of a moment's love. I have cried, pained and hoped...but most of all, I would say best forgotten. I have lived times others that I was proud of what I was: Always I will be able to say, Pararescueman to save a life and a PJ It is my duty as a my assigned duties quickly and efficiently to aid the injured. I will perform my assigned duties quickly and efficiently, placing these duties before personal desires and comforts. These things I do, "That Others May Live."



### A Navy Poem

I'm the one called "Doc"...I shall not walk in your footsteps, but I will walk by your side. I shall not walk in your image, I've earned my own title of pride. We've answered the call together, on sea and foreign land. When the cry for help was given, I've been there right at hand. Whether I am on the ocean or in the jungle wearing greens, Giving aid to my fellow man, be it Sailors or Marines. So the next time you see a Corpsman and you think of calling him "squid", think of the job he's doing as those before him did. And if you ever have to go out there and your life is on the block, Look at the one right next to you...



I'm the one called "Doc".

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